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FISHERIES INVESTIGATIONS OF THE MACKENZIE DELTA IN THE VICINITY OF THE CROSS DELTA ALTERNATIVE PIPELINE ROUTE

PRELIMINARY REPORT

by

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Part I

RESULTS OF FISHERIES INVESTIGATIONS SUMMER, 1975

INTRODUCTION

This is a preliminary report of fisheries investigations conducted along the proposed Mackenzie Delta Alternative Pipeline Route during the summer of 1975. The major objective of the studies was to provide a basis for assessing the potential impact of the proposed pipeline project on fish populations in the outer Delta. This report is limited to a presentation of data describing the distribution, relative abundance, length-frequency, sex, and maturity of fish species captured in the area, and a presentation of data describing benthic invertebrate populations. Less complete data are presented for various water quality parameters.

A detailed final report including summary life histories of major fish species and further water quality data will be available when analyses have been completed.

METHODS

Fisheries crews operated out of two field camps on the Mackenzie Delta from July 2 to September 22, 1975 (Figure 1). The crew from Camp I studied the area from the west side of the Delta up to and including Shallow Bay (Area I), and the crew from Camp II studied the area from North Reindeer Channel to East Channel (Area II).

Water Quality

Measurements of water quality parameters in the field included water depth (staff gauge), water temperature (maximum-minimum thermometer), and dissolved oxygen (Hach Oxygen Kit, Model OX-10). The transparency of the water was measured in Area II only, using a Secchi disc. Samples for the analysis of suspended sediment concentrations, turbidity, and specific conductivity were collected using a depth integrating US DH-48 hand sampler and preserved with 1 ml of 0.004 M $CuSO_4$ solution for later analysis. In addition, surface water samples were collected periodically, preserved, and shipped to the Calgary laboratory for detailed

Figure 1. Map of the study area in the Mackenzie Delta indicating the proposed Cross-Delta pipeline route (heavy line) and location of base camps (dots) in Areas I and II.

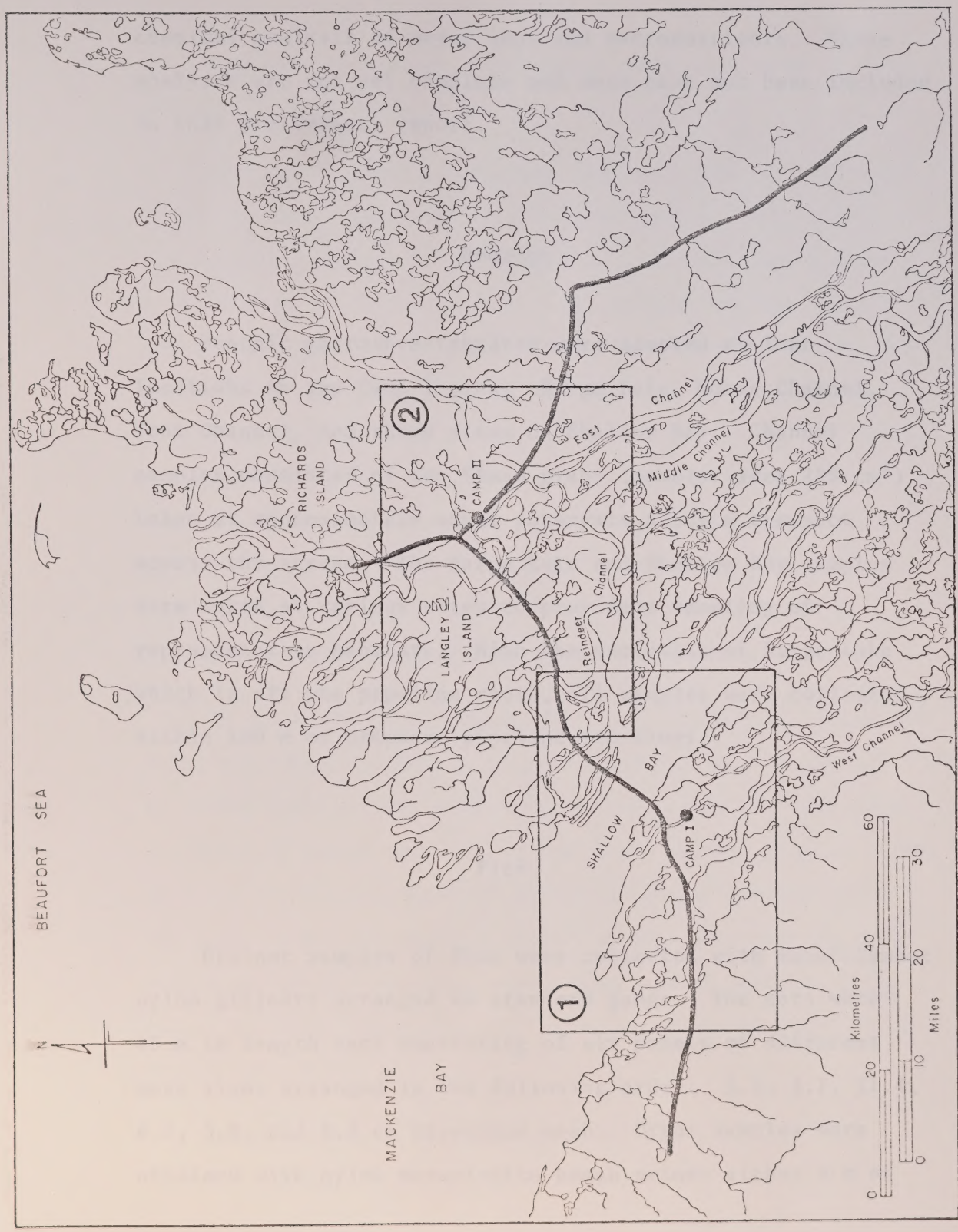

BEAUFORT SEA
RICHARDS ISLAND
LANGLEY ISLAND
CAMP II
CAMP I
East Channel
Middle Channel
Reindeer Channel
West Channel
SHALLOW BAY
MACKENZIE BAY
N
Kilometres
Miles
0
20
40
60
0
10
20
30
1
2

FIGURE 1

chemical analysis of major ions and macronutrients. These analyses are not yet complete and data have not been included in this preliminary report.

Benthos

Benthic macroinvertebrates were sampled at four locations in the Camp I area: Barge Lake, Moose Channel, West Channel, and three sites on Shallow Bay. Channel samples consisted of ten Ekman grabs (sampler area 225 cm^2) taken at approximately equal intervals along a transect across the stream. The Barge Lake and Shallow Bay samples were taken at various sites to provide a sampling of representative habitats. With the exception of Barge Lake which is off the pipeline route, all samples were collected within 100 m of proposed pipeline crossings.

Fish

Gillnet samples of fish were collected with monofilament nylon gillnets arranged in standard gangs. The nets were 45 m in length each consisting of six panels of different mesh sizes arranged in the following order: 2.5, 5.1, 11.4, 6.4, 3.8, and 8.9 cm stretched mesh. Other samples were obtained with nylon marquisette beach seines either 6 m or

3 m long and 1.3 m deep. The longer seine was used in Area I and the shorter in Area II.

Permanent sampling stations were selected in both Area I (four stations) and Area II (three stations). At each of these sites (Figures 2 and 3), 24 hr gillnet samples were collected at 10 to 14 day intervals throughout the summer. Beach seine samples were also taken at each site during the period that the gillnets were fishing. Seine samples in Area I consisted of five hauls of a 6 m seine, each covering a distance of about 10 m parallel to shore. Thus each sample included the combined catch from a maximum area of approximately 300 m^2. In Area II, seine samples consisted of four hauls of a 3 m beach seine, each covering 10 m parallel to shore (approximately 120 m^2 maximum area).

In addition to permanent stations, nearly all accessible lakes and channels within an approximate 3 km corridor (1.5 km on either side of the proposed pipeline right-of-way) were surveyed at least once during the study period (Figures 2 and 3). The techniques used in obtaining survey samples were the same as for Permanent Stations except that the gillnet sets were shorter (approximately four hours) and the seine effort in Area II usually consisted of only two seine hauls rather than four.

Some captured fish, particularly the smaller, more abundant groups, were counted, measured, and released alive,

Figure 2. Location of permanent and survey stations in Area I. Closed circles indicate permanent stations and open circles survey stations.

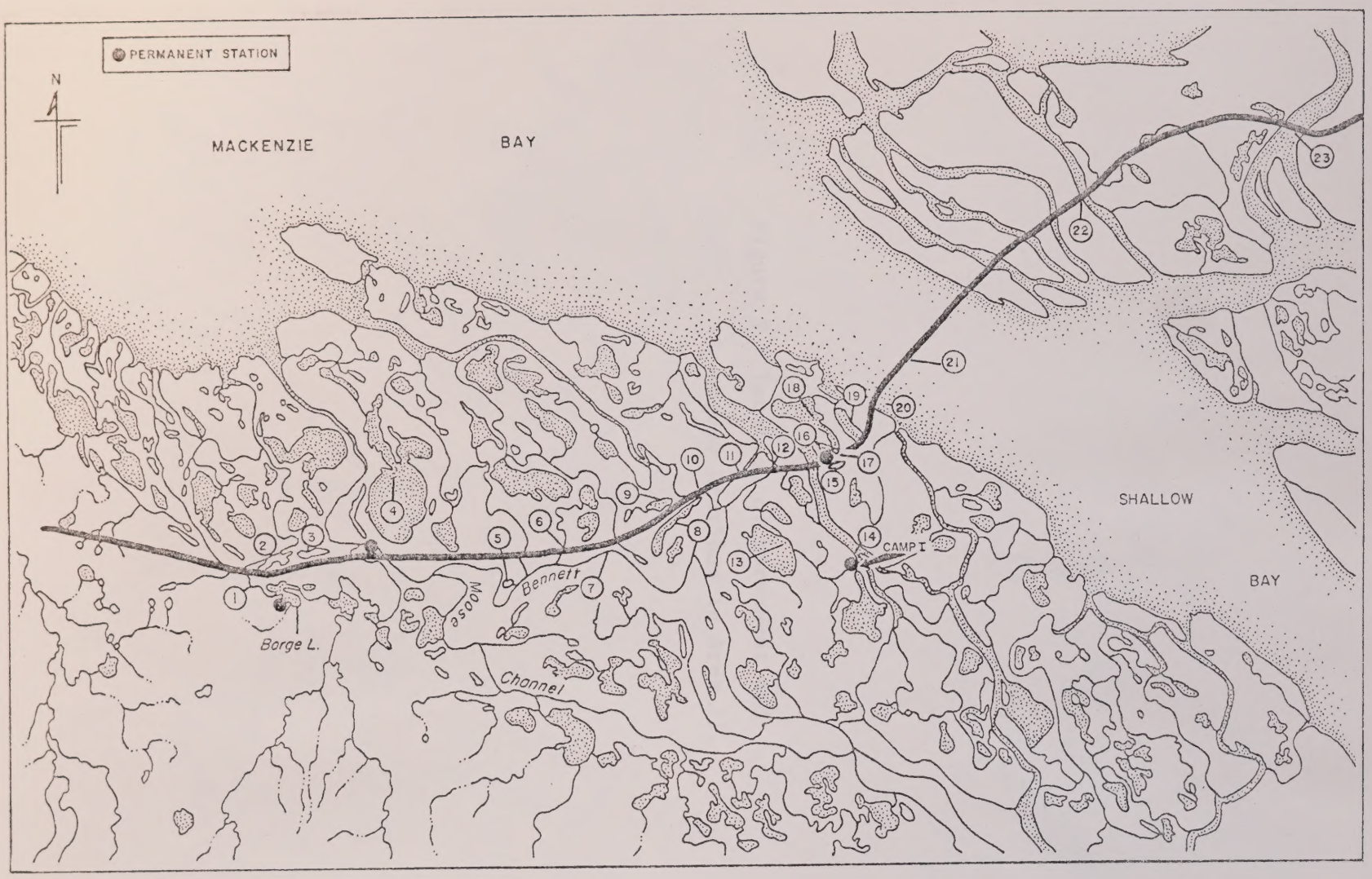

PERMANENT STATION
N
MACKENZIE
BAY
SHALLOW
BAY
CAMP I
Borge L.
Moose
Bennett
Channel
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 2

Figure 3. Location of permanent and survey stations in Area II.

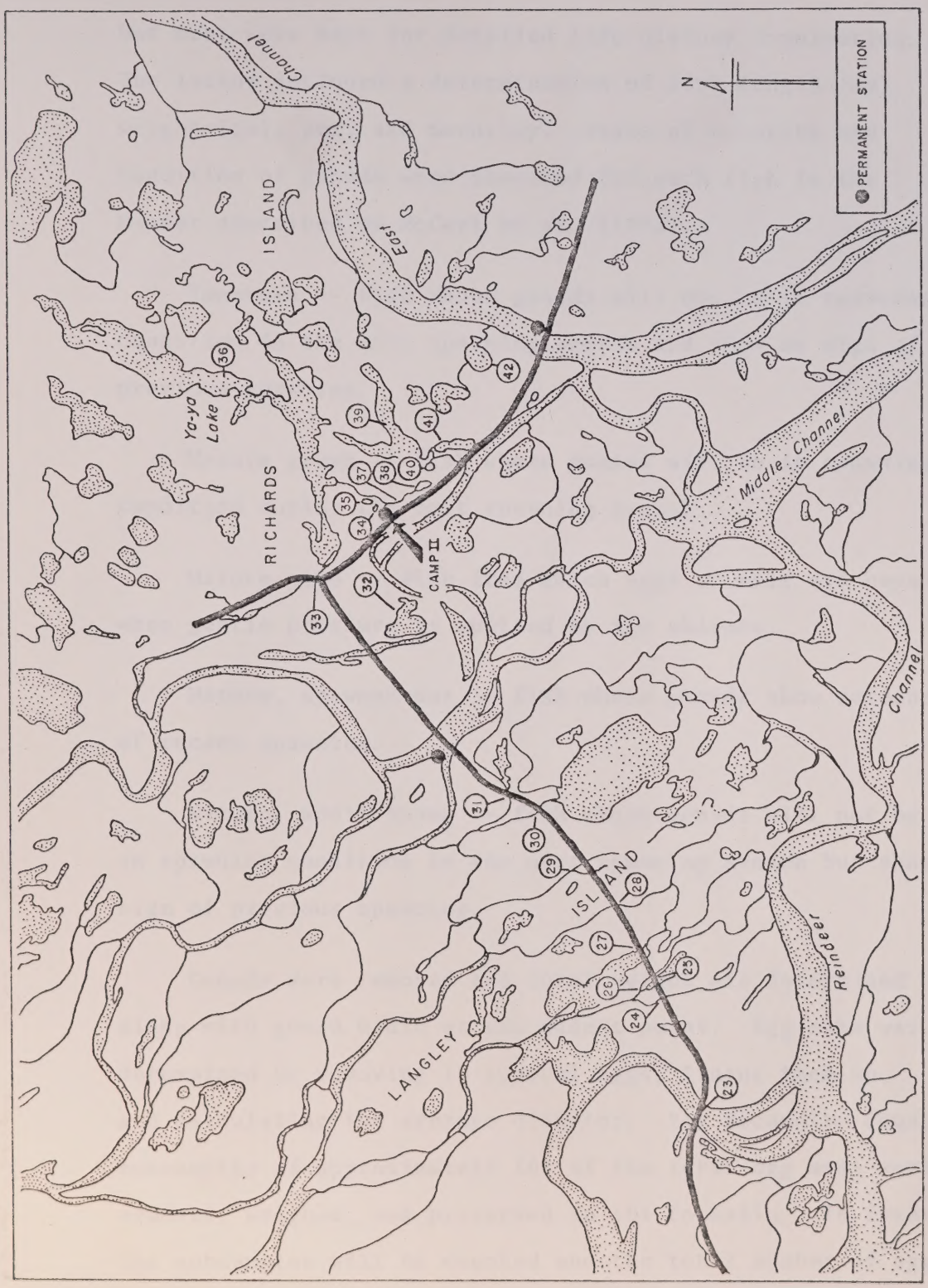

PERMANENT STATION
N
Channel
East
RICHARDS
ISLAND
Yo-yo Lake
CAMP II
Middle Channel
LANGLEY
ISLAND
Reindeer
Channel
MILES
KILOMETRES
0
5
10
15
20
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42

FIGURE 3

but most were kept for detailed life history examination. The latter included a determination of fork length (mm), weight (gm), sex, and maturity. State of maturity and condition of gonads were assessed for each fish in the manner described by McCart et al. (1972).

Immature -- fish whose gonads will not be in spawning condition in the next spawning season and show no sign of previous spawning.

Mature green -- fish whose gonads will be in spawning condition during the next spawning season.

Mature ripe -- fish from which eggs or milt are expelled when gentle pressure is applied to the abdomen.

Mature, spawned-out -- fish whose gonads show evidence of recent spawning.

Mature, won't spawn -- fish whose gonads will not be in spawning condition in the next spawning season but show sign of previous spawning.

Gonads were removed and total weight was determined along with gonad width at the widest point. Egg size was determined by removing 10 typical eggs, lining them up, and calculating the average diameter. For fecundity counts, subsamples of approximately 10% of the total egg mass were removed, weighed, and preserved in 10% formalin. In future, the subsamples will be counted and the total number of eggs

estimated by direct proportion. Where possible, the stomach contents of fish were identified to major groups in the field and stomach fullness was estimated. Various body parts were retained (scales, otoliths, fin rays, and operculae depending on species), and will be used in age determination.

RESULTS AND DISCUSSION

Physical and Chemical Parameters

An analysis of suitable physical and chemical data collected at Camps I and II show considerable differences between the east and west sides of the Mackenzie Delta (Figure 4 and Table 1). In general, conditions were more variable at Camp I than they were at Camp II. The greater variability at Camp I may be due, in part, to its proximity to the Beaufort Sea, and, in part, to the considerable influence of Peel River water in the western Delta. In contrast, Camp II is sheltered by Langley and Richards Island from the direct effects of the Beaufort Sea and is beyond the influence of water from the Peel River and other tributaries entering the western portion of the Delta.

Water temperatures were higher in July at Camp I (maximum 22.2 C) than at Camp II (maximum 20 C). A mid-August peak evident at Camp I did not occur at Camp II. In addition, an early September minimum temperature of 3.3 C at Camp I was not apparent at Camp II. These differences were probably due to Peel River influence at Camp I.

Figure 4. Seasonal fluctuations in some physical and chemical parameters at base camps on the Mackenzie Delta, 1975.

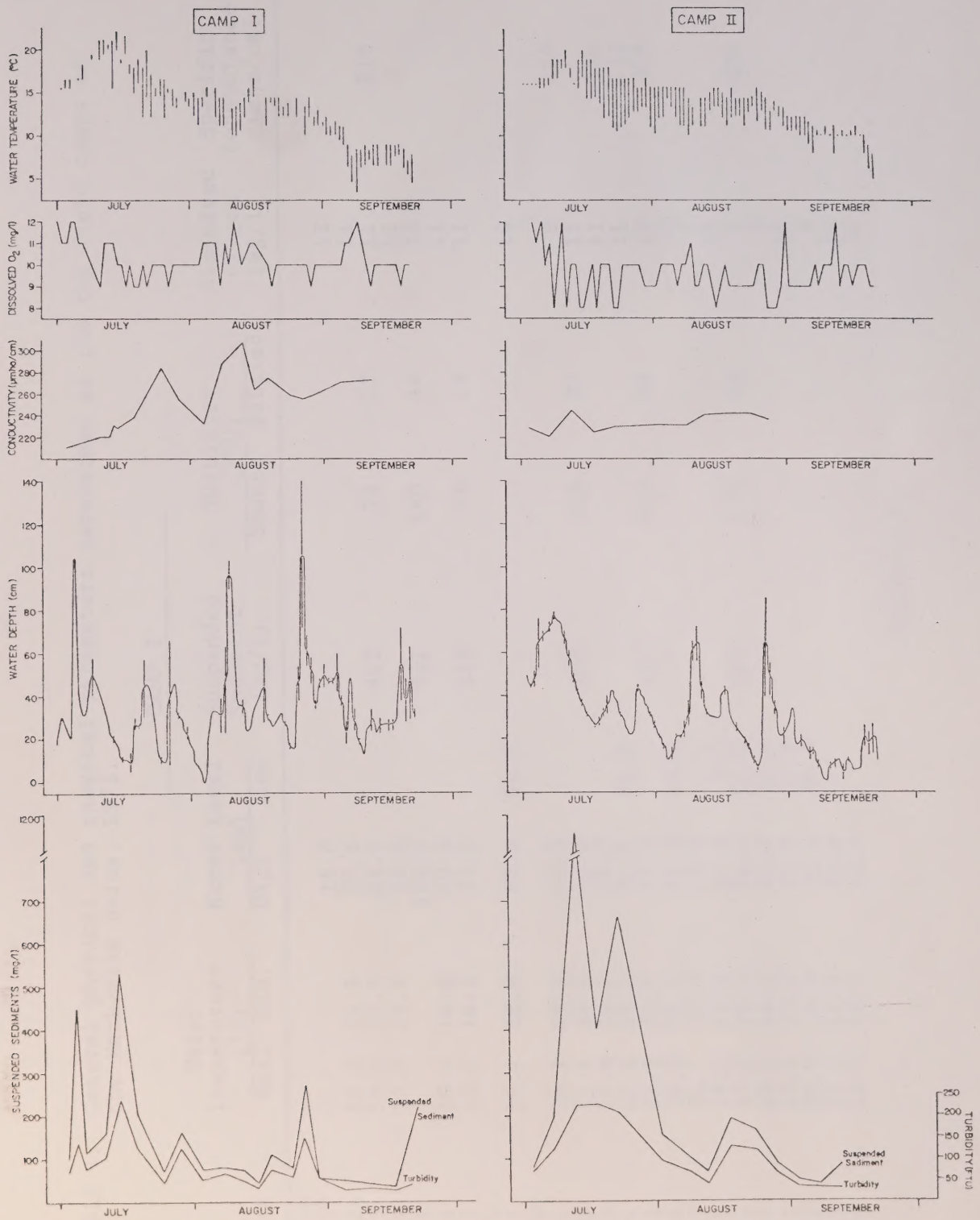

CAMP I
CAMP II
WATER TEMPERATURE (°C)
DISSOLVED O2 (mg/l)
CONDUCTIVITY (µmho/cm)
WATER DEPTH (cm)
SUSPENDED SEDIMENTS (mg/l)
TURBIDITY (TU)
JULY
AUGUST
SEPTEMBER
Suspended Sediment
Turbidity

FIGURE 4

TABLE 1. General physical and chemical parameters determined at the two field camps on the Mackenzie Delta, 1975.

CAMP I

Date	Water Temperature (°C) Max.	Min.	Water Level (cm) High	Low	Suspended Sediment (mg/l)	Turbidity (FTU) Shaken	Settled	Dissolved Oxygen (mg/l)	Specific Conductance (µmho/cm)
JULY									
1			18.0					12	
2	15.5	15.5	30.5					11	
3	16.6	15.5	25.0		102	71	23	11	210
4	16.6	15.5	20.5					12	
5			104.0		451	140	44	12	
6	16.6	16.6	40.5					11	
7	18.3	16.6	31.0		115	79	19	11	
8									
9	19.4	18.9	58.0	41.0				10	
10									
11	21.1	18.9	40.0					9	220
12	21.1	19.4	33.0		163	105	37	11	
13	20.6	20.0	23.0					11	220
14	21.1	15.5	22.0	19.0				11	230
15	22.2	20.0	17.0		532	240	83	10	228
16	18.9	18.4	12.0	10.0				10	
17	21.7	19.4	11.0					9	
18	18.3	17.2	14.0	5.0				10	
19	17.8	15.0	30.0	25.0	206	130	48	9	238
20	18.9	16.1	27.0	25.0				9	
21	17.8	12.2	57.0	31.0				10	
22	20.0	14.4	46.0	46.0				9	
23	17.2	12.2	36.0					10	
24	15.5	14.4	20.0					10	

(Continued)

TABLE 1. Continued.

Date	Water Temperature (°C) Max.	Min.	CAMP I Water Level (cm) High	Low	Suspended Sediment (mg/l)	Turbidity (FTU) Shaken	Settled	Dissolved Oxygen (mg/l)	Specific Conductance (µmho/cm)
JULY (Cont.)									
25	16.6	14.4	12.0	9.0	71	45	14	10	285
26	16.6	12.2	9.0					10	
27	15.5	15.0	66.0	8.0				9	
28	15.5	13.3	46.0					10	
29	14.4	13.3	32.0	30.0	165	125	51		255
30			29.0						
31	15.0	13.9	26.0	20.0				10	
AUGUST									
1	14.4	13.3	17.0	16.0				10	
2	15.0	12.2	10.0	9.0				10	
3	14.4	11.1	7.0	6.0	79	54	16	10	231
4	14.4	13.3						11	
5	15.5	14.4	18.0						
6			33.0						
7	15.5	12.2	33.0	33.0				11	
8	14.4	11.1	39.0	23.0	84	67	17	9	286
9	14.4	11.1	63.0	23.0				11	
10			103.0	90.0				10	
11	13.3	10.0	64.0					12	
12	13.3	10.0	36.0						
13	13.9	10.6	38.0	32.0	70	49	13	10	308
14	14.4	12.2	24.0						
15	15.5	13.9	26.0	26.0				11	
16	16.6	14.4	35.0	34.0	48	34	8	11	264

(Continued)

TABLE 1. Continued.

Date	Water Temperature (°C) Max.	Min.	CAMP I Water Level (cm) High	Low	Suspended Sediment (mg/l)	Turbidity (FTU) Shaken	Settled	Dissolved Oxygen (mg/l)	Specific Conductance (µmho/cm)
AUGUST (Cont.)									
17									
18			58.0	28.0					
19	14.4	11.1	31.0	29.0	110	75	16	10	275
20	14.4	13.9	26.0					9	
21	14.4	13.3	28.0					10	
22	14.4	12.2	32.0					10	
23	13.3	12.2	28.0	26.0				10	
24	13.9	12.2	18.0	15.0	82	60	20	10	259
25			16.0						
26	14.4	12.2	54.0	38.0				10	
27			140.0	72.0	273	150	39		255
28	13.3	10.0	68.0	54.0				10	
29	14.4	12.2	58.0	46.0				9	
30	12.2	11.1	38.0	34.0	56	56	19	10	260
31	12.8	11.1	48.0	44.0				10	
SEPTEMBER									
1	11.7	11.1	54.0	44.0				10	
2	12.2	10.0	48.0	46.0				10	
3	11.1	10.0	48.0	46.0				10	
4	11.7	10.0	60.0	42.0				10	
5	11.1	9.4	40.0	36.0	52	28	8	10	271
6	11.1	8.8	28.0	18.0				11	
7	8.8	6.6	48.0					11	
8	7.7	4.4	34.0	24.0					

(Continued)

TABLE 1. Continued

CAMP I

Date	Water Temperature (°C) Max.	Min.	Water Level (cm) High	Low	Suspended Sediment (mg/l)	Turbidity (FTU) Shaken	Settled	Dissolved Oxygen (mg/l)	Specific Conductance (µmho/cm)
SEPTEMBER (Cont.)									
9	8.3	3.3	20.0	18.0				12	
10	8.3	6.1	13.0						
11	8.8	6.6	26.0	25.0					
12	8.3	7.2	34.0	28.0	43	34	13	10	273
13	8.8	6.6	23.0	23.0				11	
14	8.8	6.6	30.0	23.0				11	
15									
16	8.8	6.6	29.0	24.0				11	
17	8.8	6.6	29.0	24.0	36	27	8	11	
18	8.8	7.7	32.0					11	
19	9.0	7.8	72.0	38.0				10	
20	8.3	6.1	48.0	28.0				11	
21	7.2	5.5	63.0	30.0				11	
22	7.8	4.4	34.0	30.0	223	40	6		

CAMP II

(Continued)

TABLE 1. Continued.

CAMP II

Date	Water Temperature (°C) Max.	Min.	Water Level (cm) High	Low	Suspended Sediment (mg/l)	Turbidity (FTU) Shaken	Settled	Dissolved Oxygen (mg/l)	Specific Conduct. (µmho/cm)	Secchi (cm)
JULY										
1										
2			50.0	49.0						16
3			45.0	44.0	76	69	15		229	13
4			52.0	44.0				12		17
5			76.0	53.0				11		15
6	16.7	15.6	70.0	66.0				12		14
7	16.7	15.6	70.0	69.0				10		12
8	16.7	16.1	74.0	70.0	201	125	25	11	221	11
9	18.9	16.7	78.0	76.0				8		10
10	18.9	16.7	74.0					8		12
11	18.9	17.8	70.0	64.0				12		9
12	20.0	17.8	61.0	54.0				8		10
13	17.8	16.7	50.0	46.0	1162	225	52	10	245	9
14			43.0	41.0				10		1
15	18.9	15.6	38.0	35.0				8		1
16	20.0	16.7	32.0	30.0				8		1
17	18.9	14.4	29.0					8		1
18	18.9	14.4	27.0	25.0	401	230	38	10	223	8
19	17.8	14.4	30.0	26.0				8		6
20	17.8	13.9	34.0	30.0				10		9
21	17.8	12.2	40.0	32.0				10		10
22	17.8	12.2	42.0	42.0				10		10
23	16.7	11.1	38.0	38.0	664	210	39	8		7
24	16.7	10.6	32.0	30.0				8		8
25	16.7	11.1	26.0	26.0				10		8
26	16.7	11.7	22.0					10		11

(Continued)

TABLE 1. Continued.

Date	Water Temperature (°C) Max.	Min.	CAMP II Water Level (cm) High	Low	Suspended Sediment (mg/l)	Turbidity (FTU) Shaken	Settled	Dissolved Oxygen (mg/l)	Specific Conduct. (µmho/cm)	Secchi (cm)
JULY (Cont.)										
27	16.7	12.2	23.0					10		11
28	16.7	12.8	45.0	42.0				10		12
29	15.6	12.8	40.0	39.0				10		14
30	15.6	13.3	36.0	34.0				9		13
31	16.7	13.3	32.0	30.0				9		9
AUGUST										
1	15.6	11.1	28.0	25.0				9		8
2	15.6	10.2	22.0	20.0	159	96	16	9	231	11
3	15.6	12.2	18.0	15.0				10		12
4	15.6	12.2	10.0	10.0				10		9
5	15.6	14.4	16.0	10.0				10		9
6	15.6	13.3	22.0	20.0				10		13
7	15.6	12.2	21.0	20.0				9		8
8	15.6	11.1	28.0	20.0				10		13
9	15.6	11.1	38.0	26.0	97	69	15	10	231	13
10	14.4	10.0	65.0	56.0				11		19
11	13.3	11.1	72.0	56.0				9		13
12			46.0	38.0				9		21
13	14.4	11.1	33.0	32.0	70	39	8	10	241	16
14	14.4	11.1	30.0	30.0				10		25
15	15.0	12.8	30.0	30.0				9		27
16	15.6	13.3	30.0	29.0				8		20
17	15.6	13.3	40.0					9		25
18	15.0	12.2	44.0	40.0	194	130	21	10	242	22

(Continued)

TABLE 1. Continued.

CAMP II

Date	Water Temperature (°C) Max.	Min.	Water Level (cm) High	Low	Suspended Sediment (mg/l)	Turbidity (FTU) Shaken	Settled	Dissolved Oxygen (mg/l)	Specific Conduct. (µmho/cm)	Secchi (cm)
AUGUST (Cont.)										
19	14.4	11.1	32.0					9		10
20	15.6	12.2	27.0	23.0				9		10
21	14.4	12.2	22.0	22.0				9		10
22	14.4	12.2	20.0	17.0				9		8
23	14.4	11.1	17.0	15.0				9		10
24	14.4	12.8	12.0	8.0	167	120	37	9	242	11
25	14.4	13.3	8.0	5.0				9		10
26	15.6	11.7	12.0					10		5
27	15.0	12.8	85.0	39.0				10		11
28	14.4	10.6	55.0	40.0				8		14
29	12.8	10.6	37.0	31.0	88	66	19	8	237	13
30	13.9	12.8	21.0					8		12
31	13.3	12.2	25.0	17.0				9		18
SEPTEMBER										
1	13.3	11.1	26.0	26.0				12		27
2	12.2	10.6	34.0					9		21
3	12.2	10.6	18.0	16.0	49	34	7	9		22
4	12.2	10.6	22.0	16.0				9		25
5	12.2	10.0	16.0	16.0				9		21
6	12.2	10.0	16.0	10.0				9		22
7	11.7	8.9	16.0	12.0				9		22
8	11.1	7.8	10.0	6.0	40	32	7	10		19
9	10.6	10.0	2.0					9		22
10	10.0	10.0						10		30

(Continued)

TABLE 1. Continued.

	CAMP II									
	Water Temperature (°C)		Water Level (cm)		Suspended Sediment	Turbidity (FTU)		Dissolved Oxygen	Specific Conduct.	Secchi
Date	Max.	Min.	High	Low	(mg/l)	Shaken	Settled	(mg/l)	(µmho/cm)	(cm)
SEPTEMBER (Cont.)										
11	11.1	10.0	8.0	6.0				10		23
12	10.0	10.0	10.0	6.0				10		32
13	11.1	7.8	10.0	10.0	86	30	6	12		31
14	10.0	10.0	8.0	1.0				9		23
15	10.6	10.0	11.0	9.0				10		23
16	10.0	10.0	6.0					10		29
17	10.6	10.0	6.0	6.0				9		35
18	11.1	10.0	6.0					10		24
19	10.0	10.0	26.0	16.0				10		22
20	10.0	7.8	23.0	12.0				10		21
21	8.9	6.1	27.0	13.0				9		22
22	7.8	5.0	10.0					9		24

Dissolved oxygen concentrations remained high at both camps throughout the study period.

Specific conductance at Camp I fluctuated over the course of the study period between a low of 210 µmhos/cm and a high of 308 µmhos/cm. The overall trend at Camp I was a steady increase throughout the season. At Camp II the specific conductance remained fairly constant throughout the study period ranging between 221 and 245 µmhos/cm.

Water level fluctuations were much greater at Camp I than at Camp II (Figure 4), apparently the result of influences from the Beaufort Sea. Whenever prolonged onshore winds occurred during the study period, there were impressive storm surges which caused the channel waters in the vicinity of Camp I to back up and flood low-lying regions. It would appear that water levels at Camp II, where there was an evident seasonal decline, are more closely correlated with discharge in the Mackenzie River than those at Camp I.

Suspended sediment concentrations were high at both camps. Summer peaks of 451 and 532 mg/l occurred July 5 and 15 at Camp I and 1162 and 664 mg/l July 13 and 23 at Camp II. Suspended sediment concentrations were considerably higher at Camp II than at Camp I throughout the first half of the study period. During the last half of the study, concentrations at both camps were low and quite similar except for a brief

peak at Camp I during a major storm surge, August 27.

Benthic Macroinvertebrates

The outer Mackenzie Delta supports a relatively low standing crop of benthic invertebrates (Brunskill et al., 1973). Samples collected during this study also indicated a low abundance of benthic species at all sample sites (Table 2). The most common taxa were Chironomidae and Oligochaeta, which together account for 82.1% of the total benthic fauna collected.

Barge Lake (a silty lake with channel connection) had the most abundant and diverse benthic fauna (8 major taxa) of the areas sampled. Chironomid larvae were most numerous, accounting for 71.5% of the total collected. West Channel had the second most abundant invertebrate fauna although diversity (5 major taxa) here was much lower than in Barge Lake with oligochaetes accounting for 89.8% of the total benthos. Shallow Bay and Moose Channel had the lowest standing crops of benthic invertebrates. Benthic invertebrates were least abundant in the samples collected from a deep (4 m) station in Shallow Bay (Table 2).

Marine influence was most apparent in the samples collected from the extreme west side of the Delta (Barge Lake and Moose Channel) where marine taxa such as polychaetes

TABLE 2. The numbers of benthic macroinvertebrates collected in ten Ekman grabs (225 cm^2) at stations on the Outer Mackenzie Delta, 1975.

	Barge Lake	Moose Channel	West Channel	Shallow Bay 4 m depth 1.5 miles offshore	Shallow Bay 1.5 m depth Middle	Shallow Bay 1.5 m depth West Shore	Total
Date	Aug.1	Aug.2	Aug.16	Aug.3	Aug.3	Aug.3	
DIPTERA:							
Chironimidae	209	1	13	1	2	10	236
Tipulidae	3						3
Ceratopognidae			3		1	2	6
Misc. Larvae	1						1
Misc. Pupae	6	2					8
Oligochaeta	14	2	193	10	19	3	241
Polychaeta	1	5					6
Nematoda	42	2	3	1			48
Ostracoda	7						7
Amphipoda	3	1	3		1		8
Isopoda		2					2
Mysidae	6	2					8
Total per site	292	17	215	12	23	15	574
Number/$_{m^2}$	1297.8	75.5	955.5	53.3	102.2	66.7	
Number Major Taxa	8	7	5	3	4	3	10

and mysids were present. These samples were also more diverse, containing 8 and 7 major taxa respectively, than were samples collected in Shallow Bay (4 major taxa), none of which were marine forms.

These data follow the same basic pattern described by Brunskill et al. (1973). Benthic invertebrates were more abundant in lakes than in channels and were least abundant in the predominantly freshwater estuarine regions. The samples obtained during this study do, however, show a denser benthic fauna in West Channel (955.5 organisms per m^2) than that reported by the above authors (165.7 organisms per m^2) at sites farther upstream on the same channel. In both instances, samples were obtained with a modified Ekman Dredge.

Fish

Distribution

Twenty species were collected in the Mackenzie Delta during the course of this study (Table 3). Other than the fourhorn sculpin, all of these were either freshwater or anadromous species. The species most widely distributed include humpback whitefish, inconnu, least cisco, pike, burbot, ninespine stickleback, and pond smelt (Table 4, Figures 5-14). Broad whitefish were common on both sides of

TABLE 3. Fish species caught in the Mackenzie Delta study area, 1975. A list of common, coded and scientific names.

Common Name	Code	Scientific Name
Arctic lamprey	ARLM	*Lampetra japonica* (Martens)
Inconnu	INCO	*Stenodus leucichthys nelma* (Pallas)
Humpback whitefish	HMWT	*Coregonus clupeaformis* (Mitchill)
Broad whitefish	BDWT	*Coregonus nasus* (Pallas)
Least cisco	LSCS	*Coregonus sardinella* (Valenciennes)
Arctic cisco	ARCS	*Coregonus autumnalis* (Pallas)
Round whitefish	RDWT	*Prosopium cylindraceum* (Pallas)
Lake trout	LKTR	*Salvelinus namaycush* (Walbaum)
Arctic char	CHAR	*Salvelinus alpinus* (Linnaeus)
Boreal smelt	BORS	*Osmerus eperlanus* (Linnaeus)
Pond smelt	PONS	*Hypomesus olidus* (Pallas)
Northern pike	PIKE	*Esox lucius* (Linnaeus)
Lake chub	LKCB	*Couesius plumbeus* (Agassiz)
Longnose sucker	LNSK	*Catostomus catostomus* (Forster)
Trout-perch	TRPH	*Percopsis omiscomaycus* (Walbaum)
Burbot	BURB	*Lota lota* (Linnaeus)
Ninespine stickleback	NNST	*Pungitius pungitius* (Linnaeus)
Fourhorn sculpin	FHSC	*Myoxocephalus quadricornis quadricornis* (Linnaeus)
Slimy sculpin	SLSC	*Cottus cognatus* (Richardson)
Spoonhead sculpin	SPSC	*Cottus ricei* (Nelson)

TABLE 4. List of fish species caught at Permanent and Survey Stations in the Mackenzie Delta, 1975.

Survey Stns.	SPECIES																		
	ARLM	INCO	HMWT	BDWT	LSCS	ARCS	RDWT	LKTR	CHAR	BORS	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	FHSC	SLSC	SPSC
1		+	+		+	+					+	+					+			
2				+	+												+			
3				+								+					+			
4		+	+																	
5		+	+		+						+	+			+	+	+			+
6		+	+									+			+	+				+
7			+	+	+		+				+	+			+					+
8				+	+						+	+					+			
9		+	+	+												+				
10					+						+	+		+	+		+			+
11		+	+		+				+		+	+		+	+		+			
12		+	+	+	+		+				+	+		+	+	+	+			+
13				+							+				+	+				
14																	+			
15		+			+						+			+	+	+	+			+
16		+	+												+					
17			+		+						+									+
18			+		+	+					+	+		+	+	+	+			+
19		+	+		+						+	+	+	+	+		+			+
20			+			+					+	+		+	+	+	+			+
21											+									
22		+																		
23		+			+	+						+		+	+	+				+
24														+						+
25											+			+	+		+			+
26											+					+	+			+

(Continued)

TABLE 4. Continued.

Survey Stns.	SPECIES																		
	ARLM	INCO	HMWT	BDWT	LSCS	ARCS	RDWT	LKTR	CHAR	BORS	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	FHSC	SLSC	SPSC
27		+	+		+							+		+	+	+	+			+
28		+	+		+							+		+	+		+			+
29			+	+								+					+			
30					+						+			+	+	+	+			+
31	+															+				+
32				+													+			
33		+	+	+	+						+	+			+		+			+
34			+		+							+		+			+			+
35			+									+					+			
36			+					+				+								
37				+	+												+			
38		+	+	+	+						+	+				+	+			
39		+	+	+	+			+			+	+		+	+	+			+	+
40			+	+								+		+			+		+	
41		+	+	+	+						+	+		+	+	+	+		+	+
42		+	+	+	+							+			+		+			+
Permanent Stns.																				
Barge Lake		+	+	+		+	+				+	+				+	+			
Moose Channel		+	+	+	+	+	+		+		+	+		+		+	+	+		
West Channel		+	+								+	+	+	+	+	+	+			+
Camp I		+	+	+		+	+				+	+	+	+	+	+	+			+
Langley Channel	+	+	+		+						+		+	+		+	+			+
Camp II		+	+	+	+						+	+	+	+	+	+	+			+
East Channel		+	+	+	+	+				+	+	+	+	+	+	+	+			+

Figures 5-14. Known distribution of fishes in the study area. The data include the results of the 1975 study as well as information from Slaney (1974) and Percy et al. (1974).

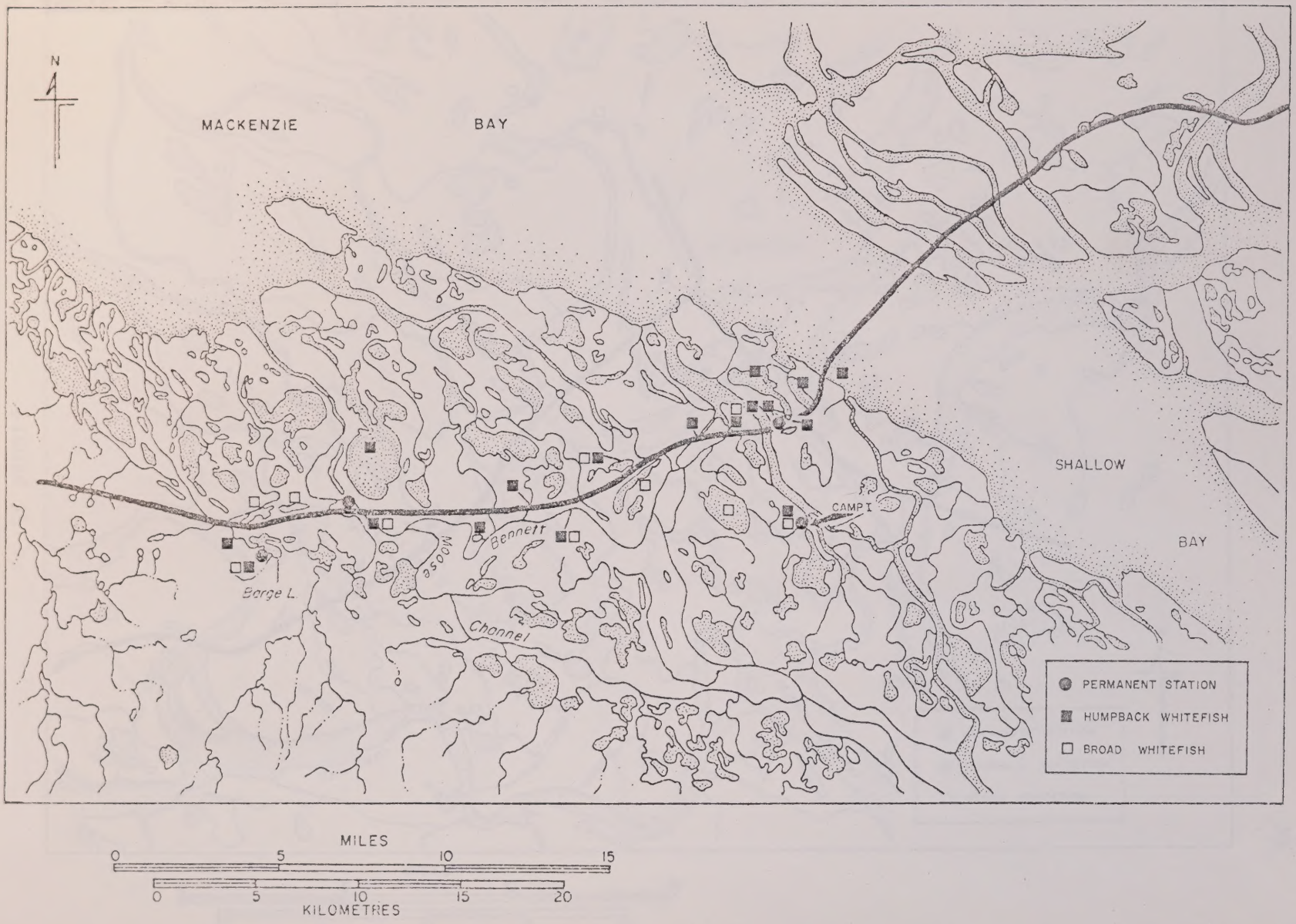

N
MACKENZIE
BAY
SHALLOW
BAY
CAMPI
Bennett
Moose
Channel
Borge L.
PERMANENT STATION
HUMPBACK WHITEFISH
BROAD WHITEFISH
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 5a

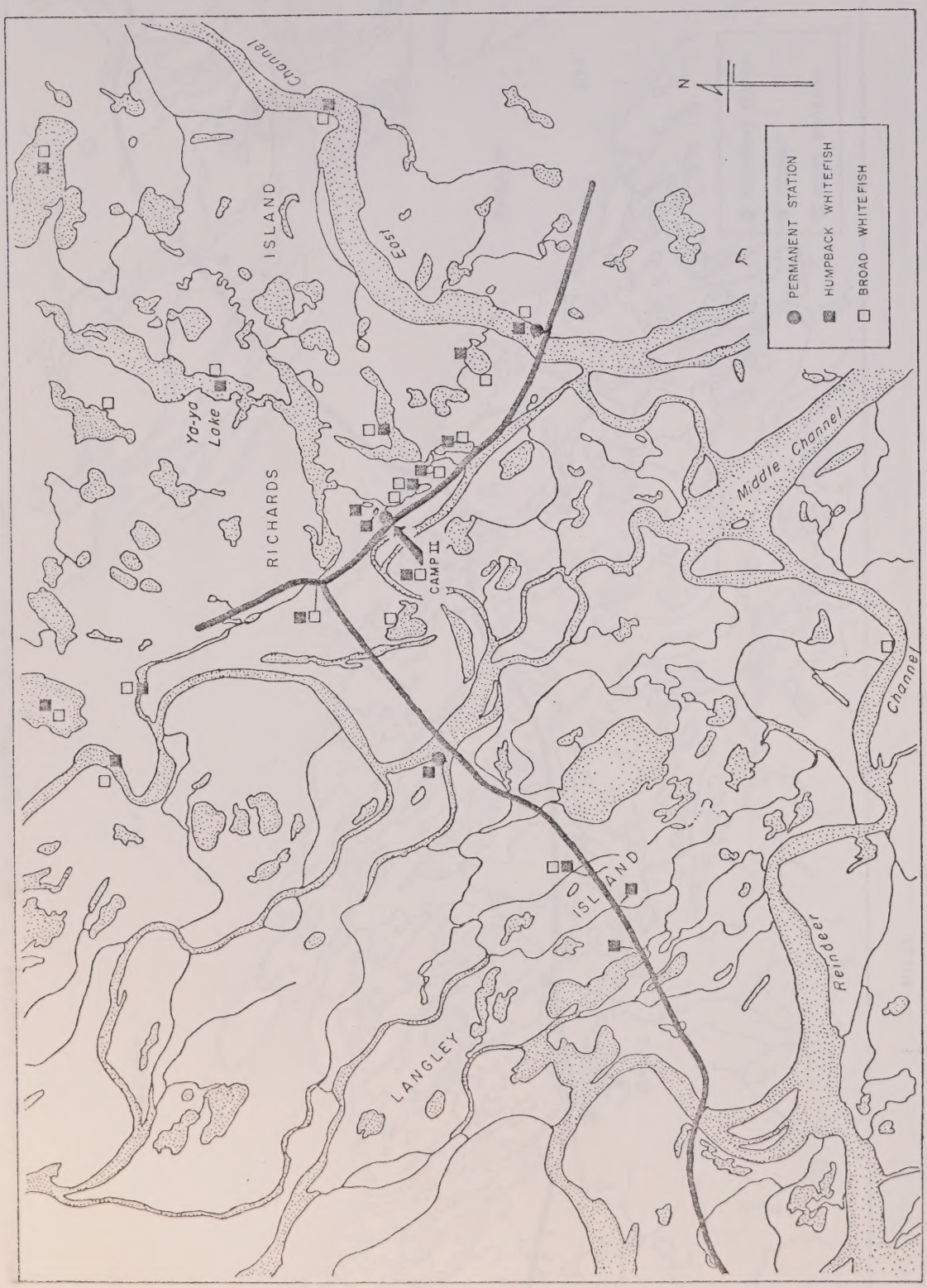

Channel
East
ISLAND
Ya-yo Lake
RICHARDS
CAMP II
Middle Channel
Channel
ISLAND
Reindeer
LANGLEY
N
PERMANENT STATION
HUMPBACK WHITEFISH
BROAD WHITEFISH
MILES
0
5
10
15
KILOMETRES
0
5
10
15
20

FIGURE 5b

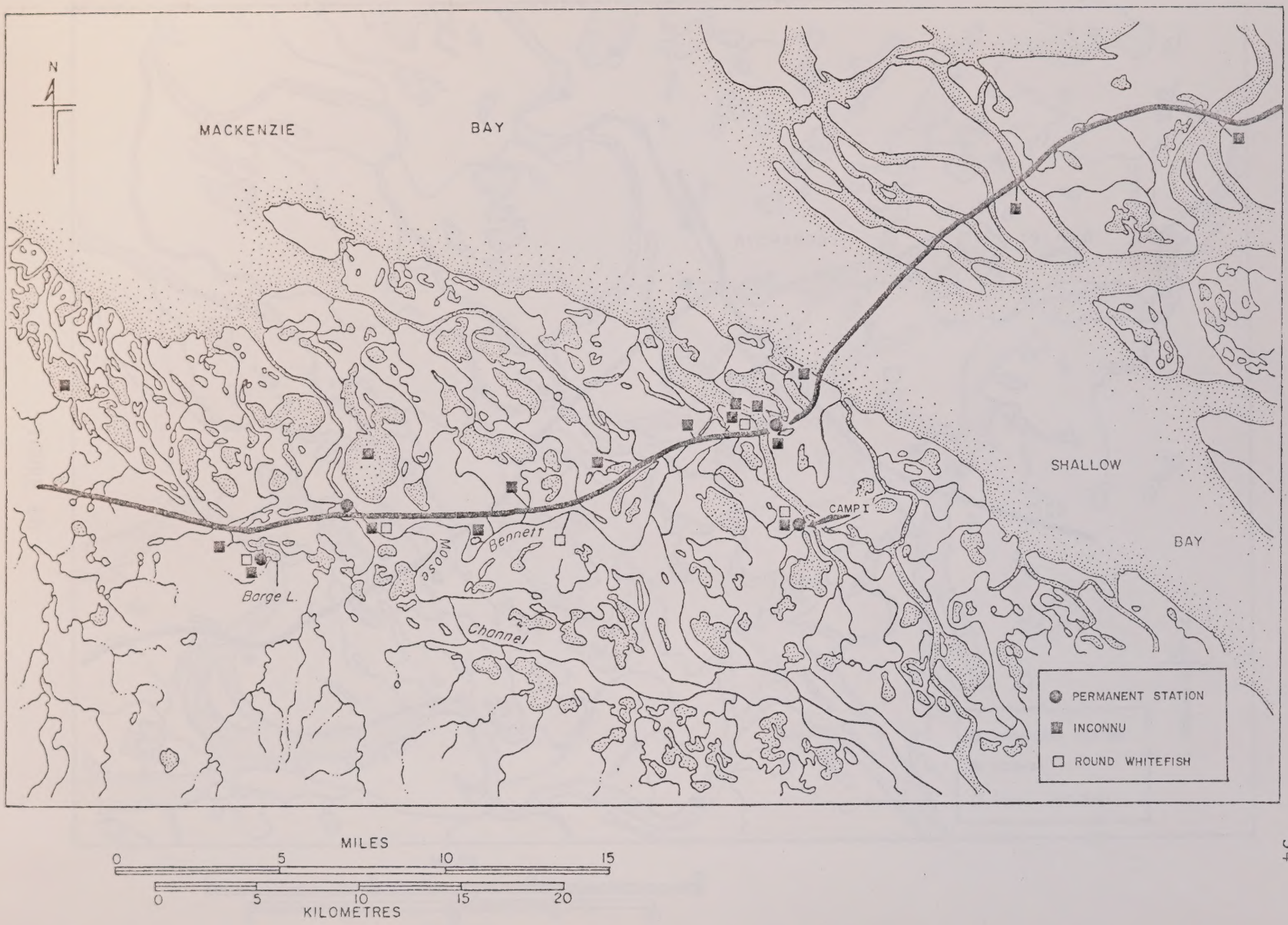

N
MACKENZIE
BAY
SHALLOW
BAY
CAMP I
Bennett
Moose
Channel
Borge L.
PERMANENT STATION
INCONNU
ROUND WHITEFISH
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 6a

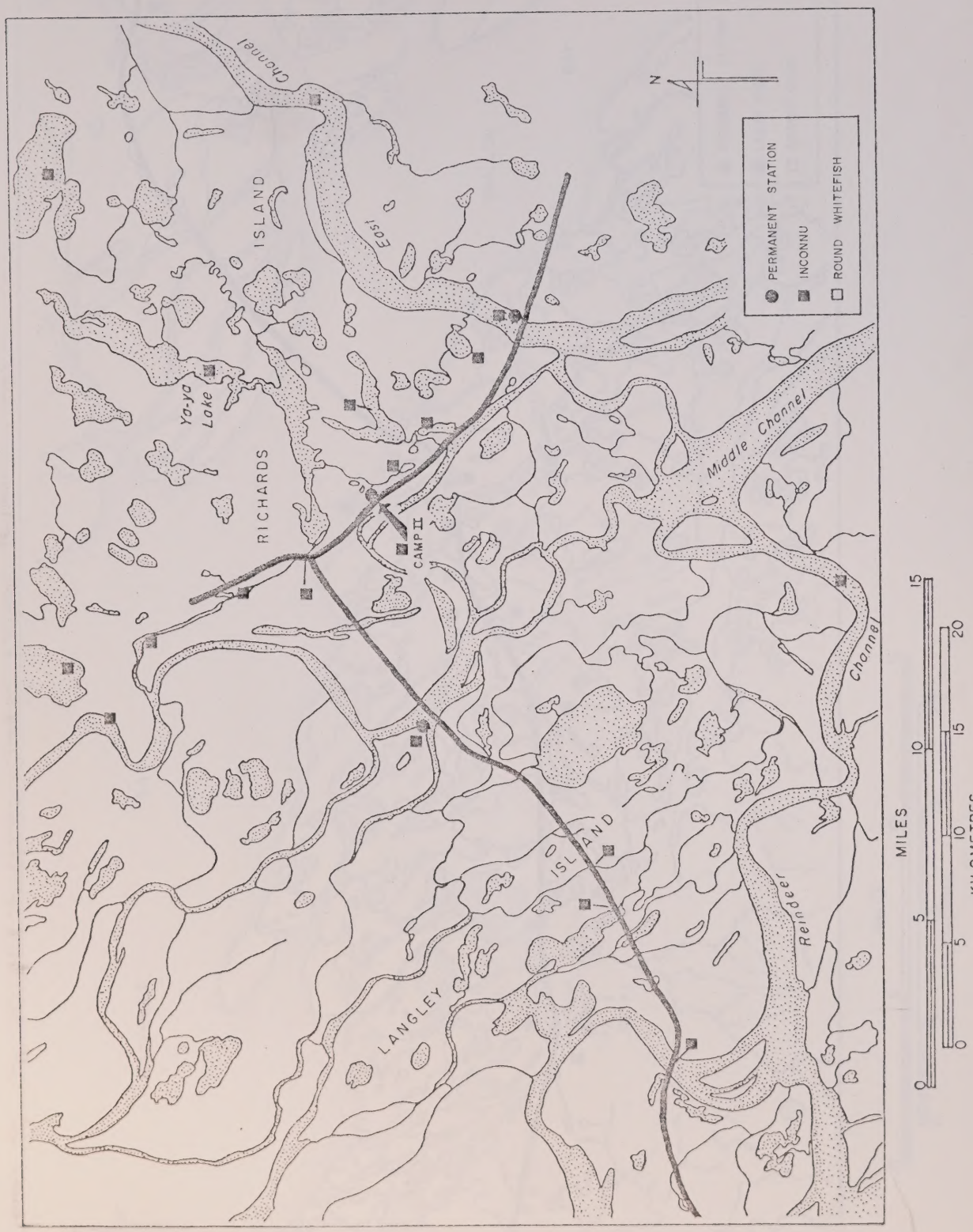

Channel
ISLAND
Ya-ya Lake
RICHARDS
Eo's
CAMP II
Middle Channel
Channel
ISLAND
Reindeer
LANGLEY
N
PERMANENT STATION
INCONNU
ROUND WHITEFISH
MILES
KILOMETRES
0
5
10
15
0
5
10
15
20

FIGURE 6b

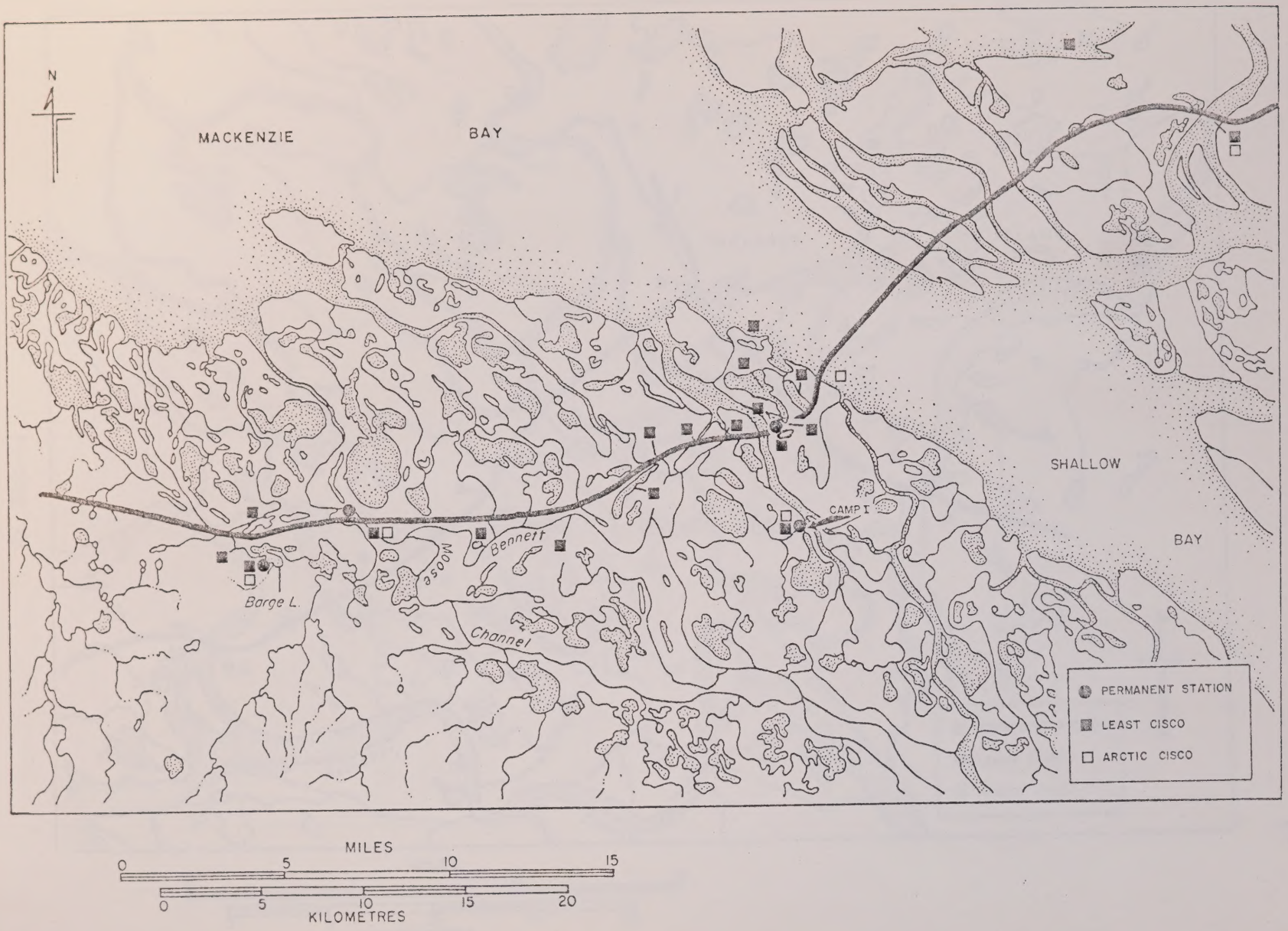

N
MACKENZIE
BAY
SHALLOW
BAY
CAMP I
Bennett
Moose
Channel
Barge L.
PERMANENT STATION
LEAST CISCO
ARCTIC CISCO
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 7a

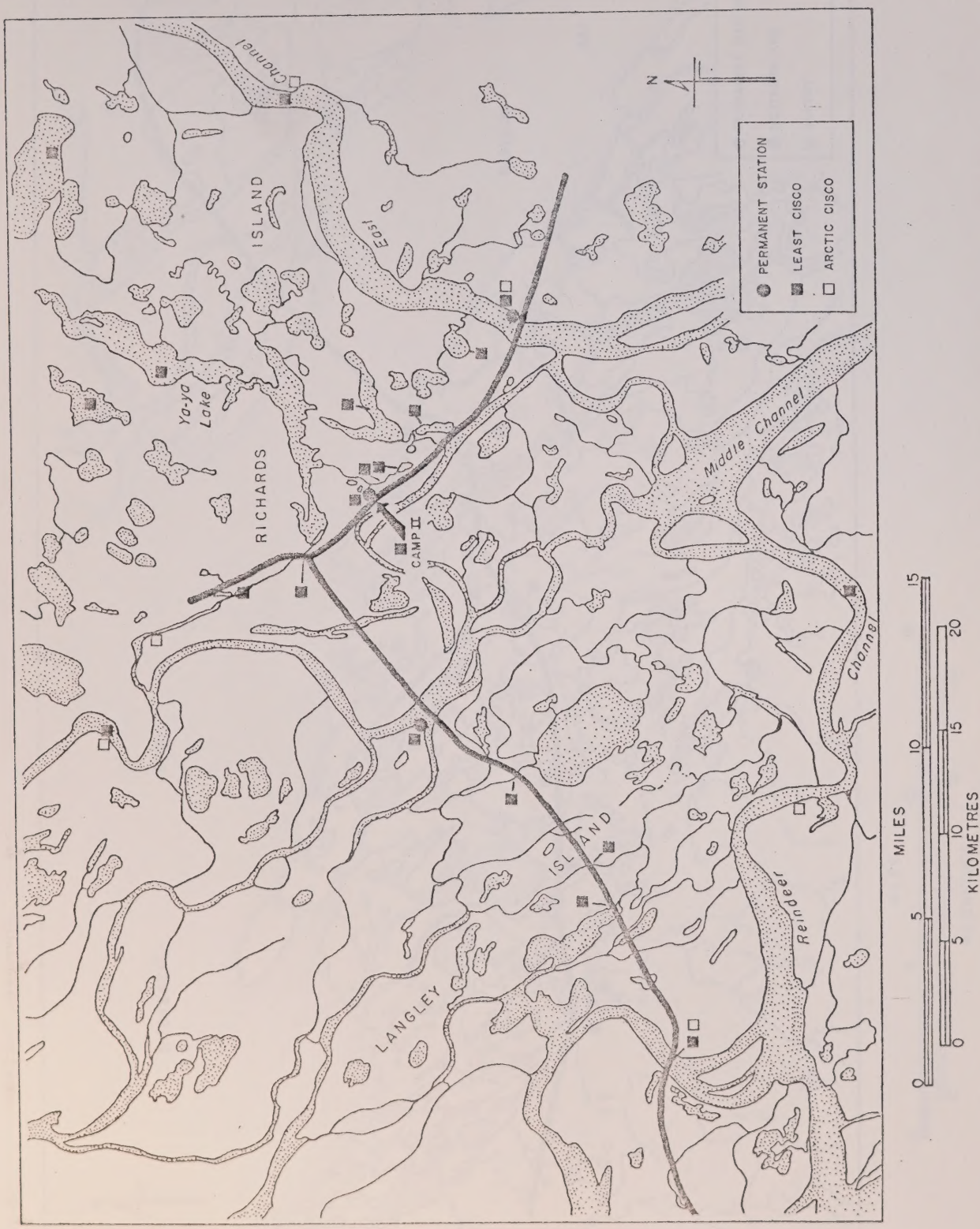

Channel
ISLAND
Eost
Ya-ya Lake
RICHARDS
CAMP II
Middle Channel
Channel
ISLAND
Reindeer
LANGLEY
N
PERMANENT STATION
LEAST CISCO
ARCTIC CISCO
MILES
KILOMETRES
0
5
10
15
20

FIGURE 7b

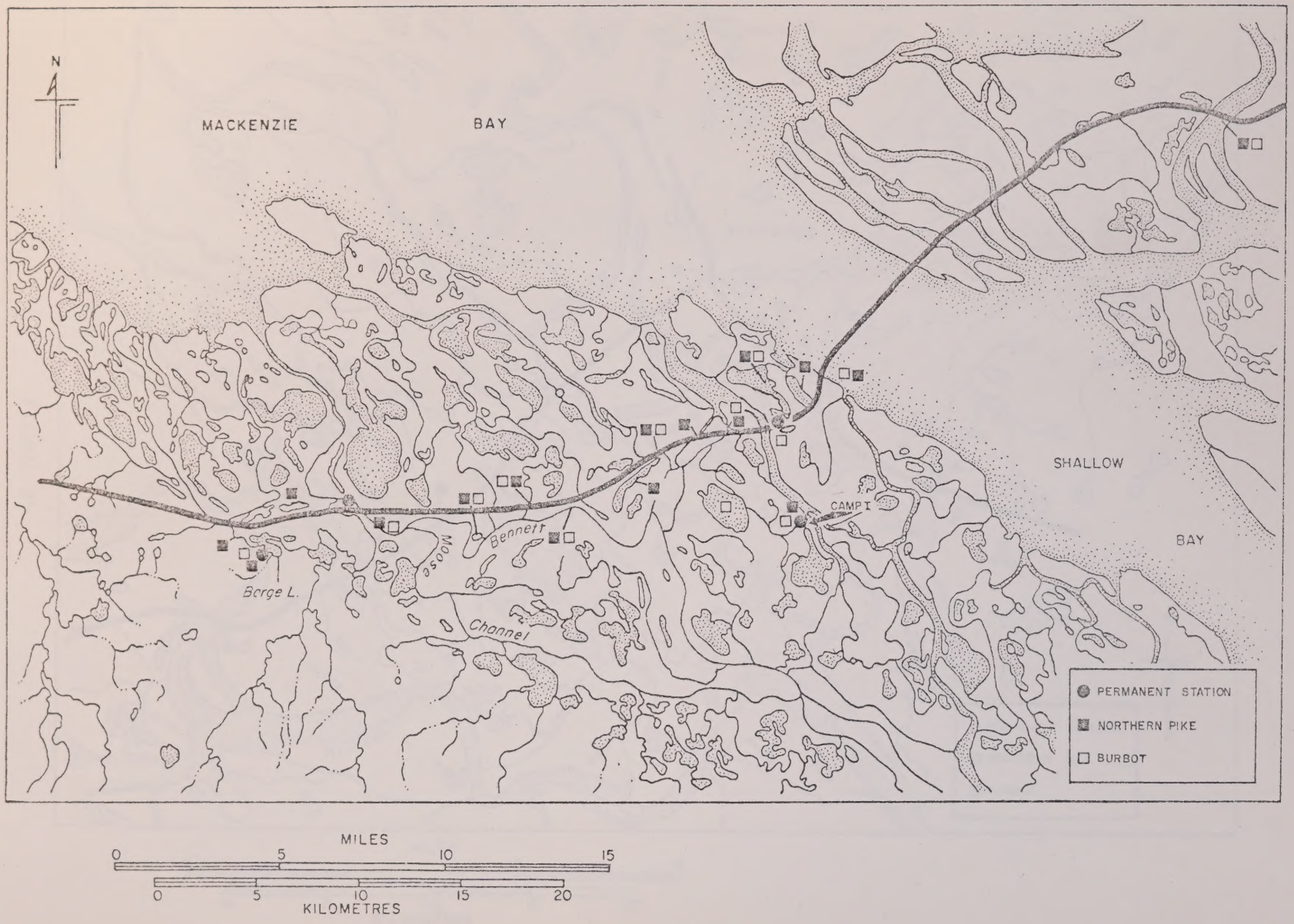

N
MACKENZIE
BAY
SHALLOW
BAY
CAMPI
Bennett
Moose
Channel
Borge L.
PERMANENT STATION
NORTHERN PIKE
BURBOT
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 8a

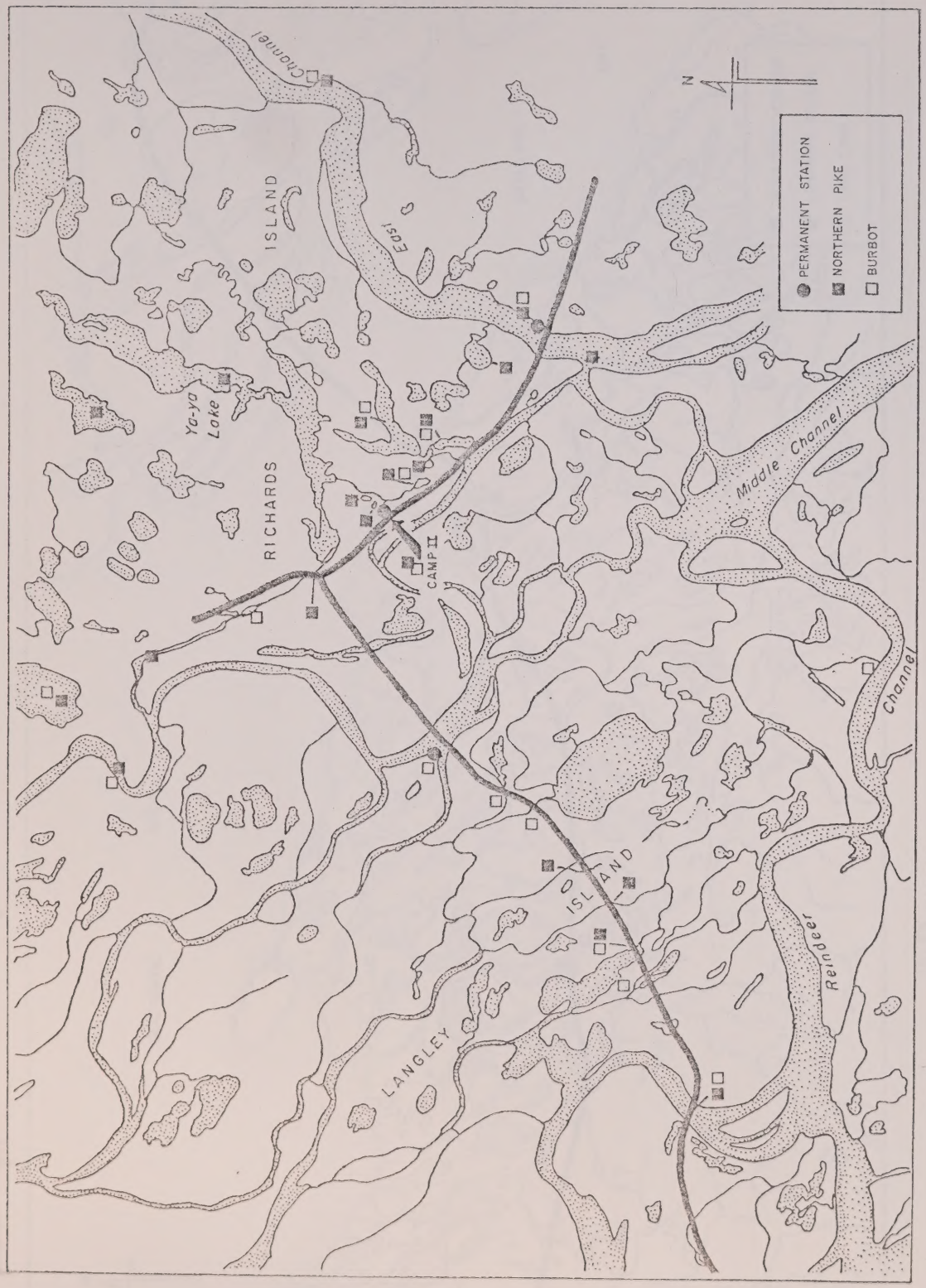

Channel
East
ISLAND
Ya-ya Lake
RICHARDS
CAMP II
Middle Channel
Channel
ISLAND
Reindeer
LANGLEY
N
PERMANENT STATION
NORTHERN PIKE
BURBOT
MILES
KILOMETRES
0
5
10
15
5
10
15
20

FIGURE 8b

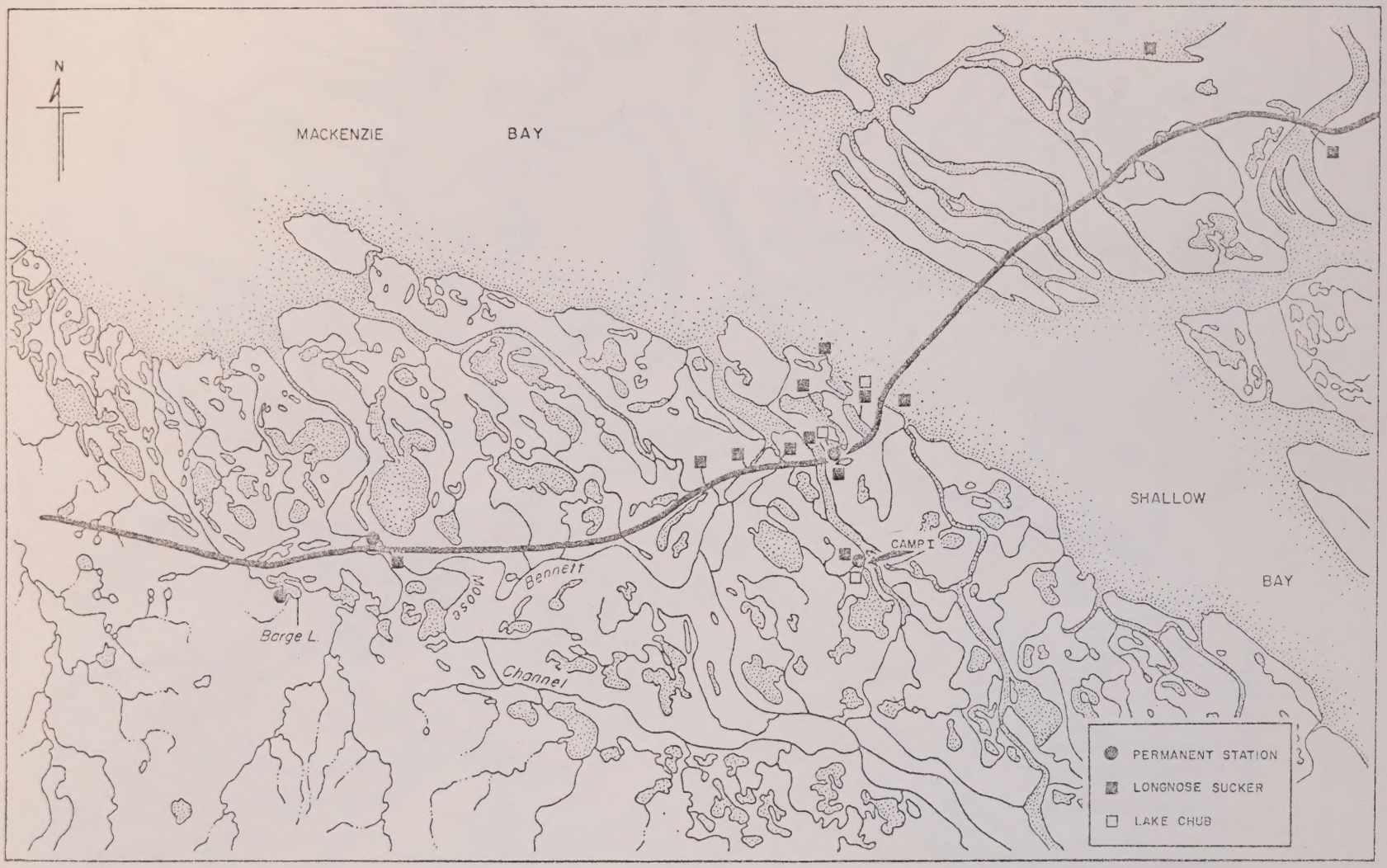

N
MACKENZIE
BAY
SHALLOW
BAY
CAMP I
Bennett
Moose
Barge L.
Channel
PERMANENT STATION
LONGNOSE SUCKER
LAKE CHUB
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 9a

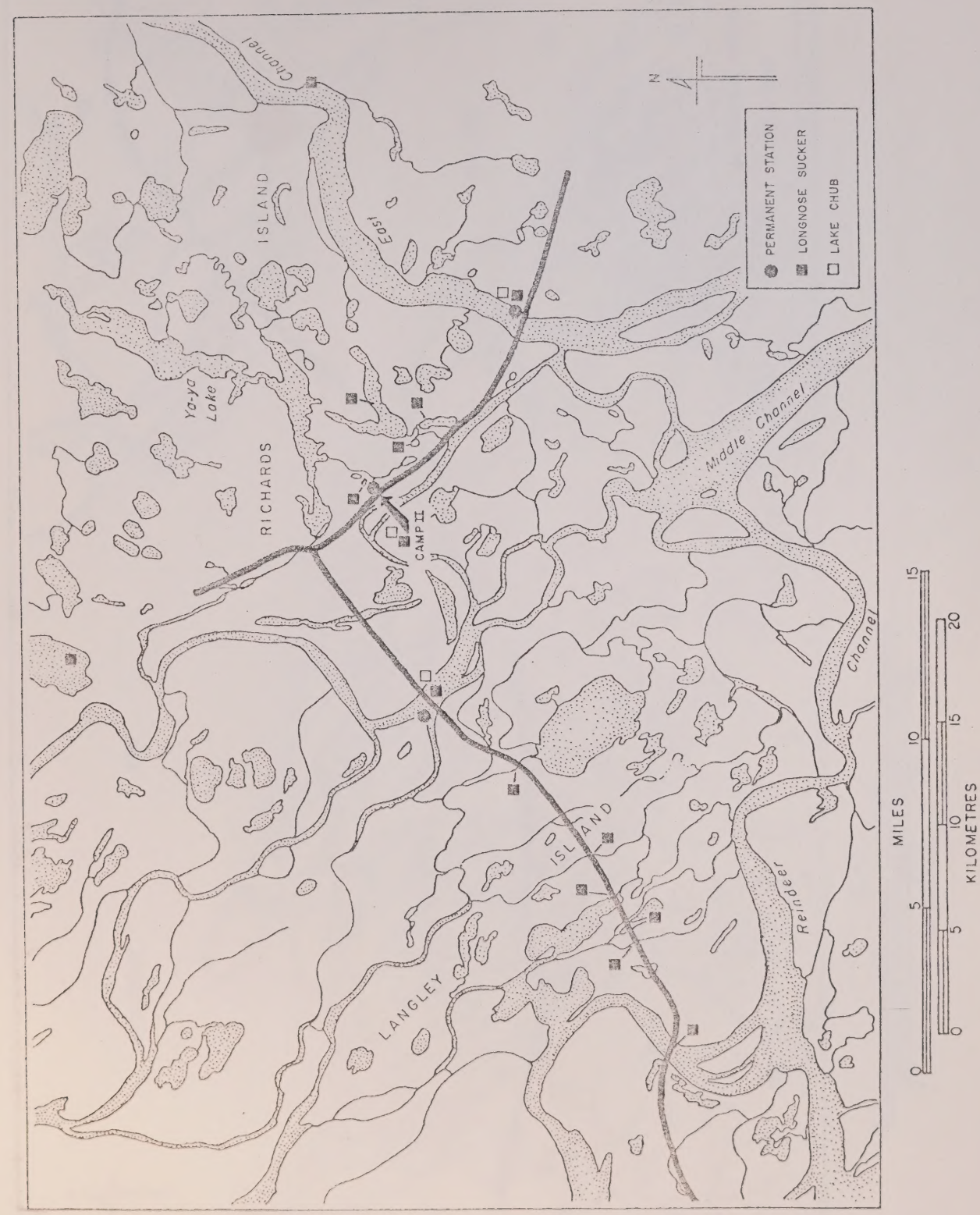

Chicannel
ISLAND
Yo-yo Lake
RICHARDS
CAMP II
Middle Channel
Channel
ISLAND
LANGLEY
Reindeer
N
PERMANENT STATION
LONGNOSE SUCKER
LAKE CHUB
MILES
KILOMETRES
0
5
10
15
0
5
10
15
20

FIGURE 9b

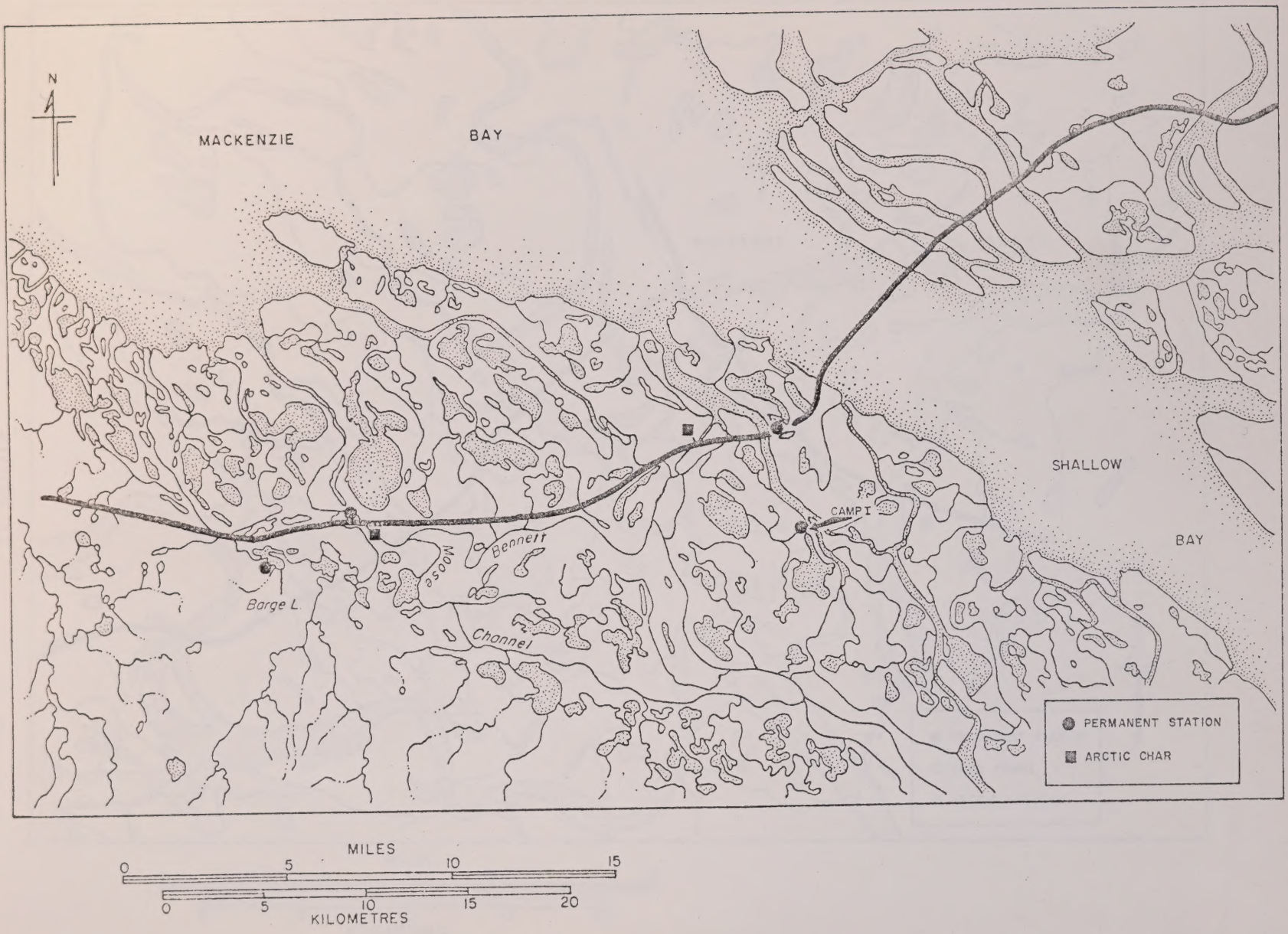

N
MACKENZIE
BAY
SHALLOW
BAY
CAMPI
Bennett
Moose
Channel
Borge L.
PERMANENT STATION
ARCTIC CHAR
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 10

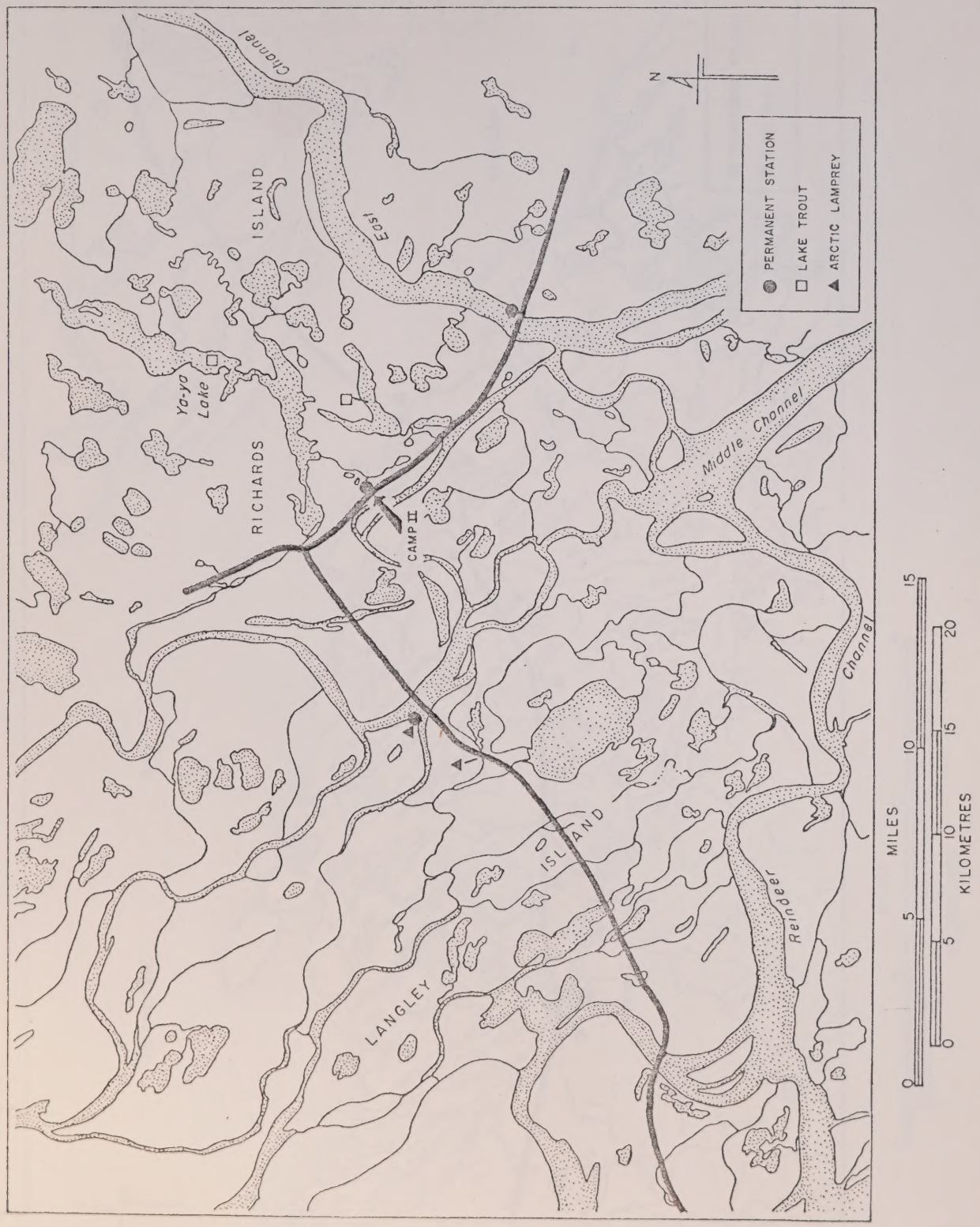

Channel
ISLAND
RICHARDS
Ya-yo Lake
East
CAMP II
Middle Channel
Channel
ISLAND
LANGLEY
Reindeer
N
PERMANENT STATION
LAKE TROUT
ARCTIC LAMPREY
MILES
0
5
10
15
KILOMETRES
0
5
10
15
20

FIGURE 11

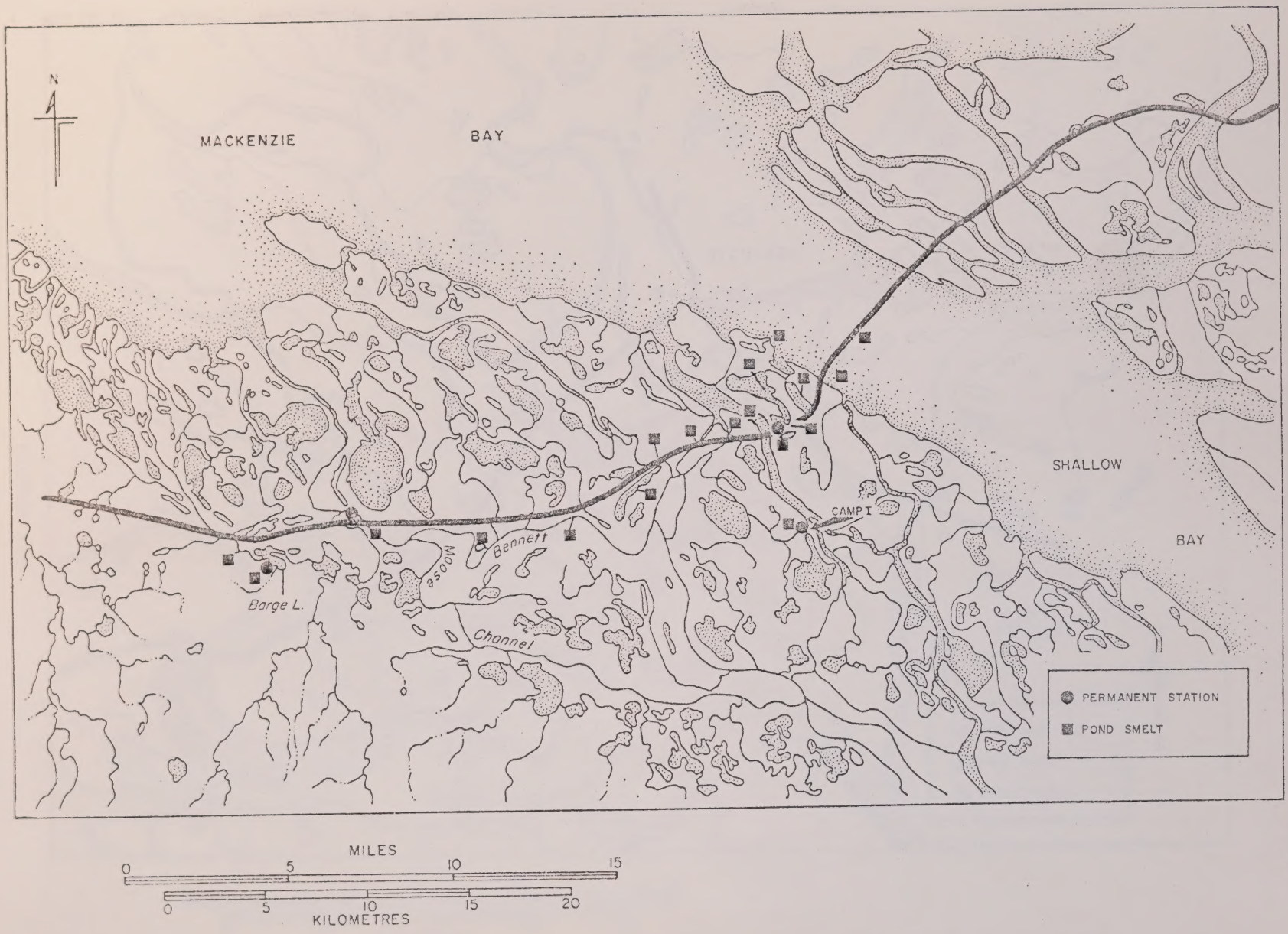

N
MACKENZIE
BAY
SHALLOW
BAY
CAMP I
Bennett
Moose
Channel
Borge L.
PERMANENT STATION
POND SMELT
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 12a

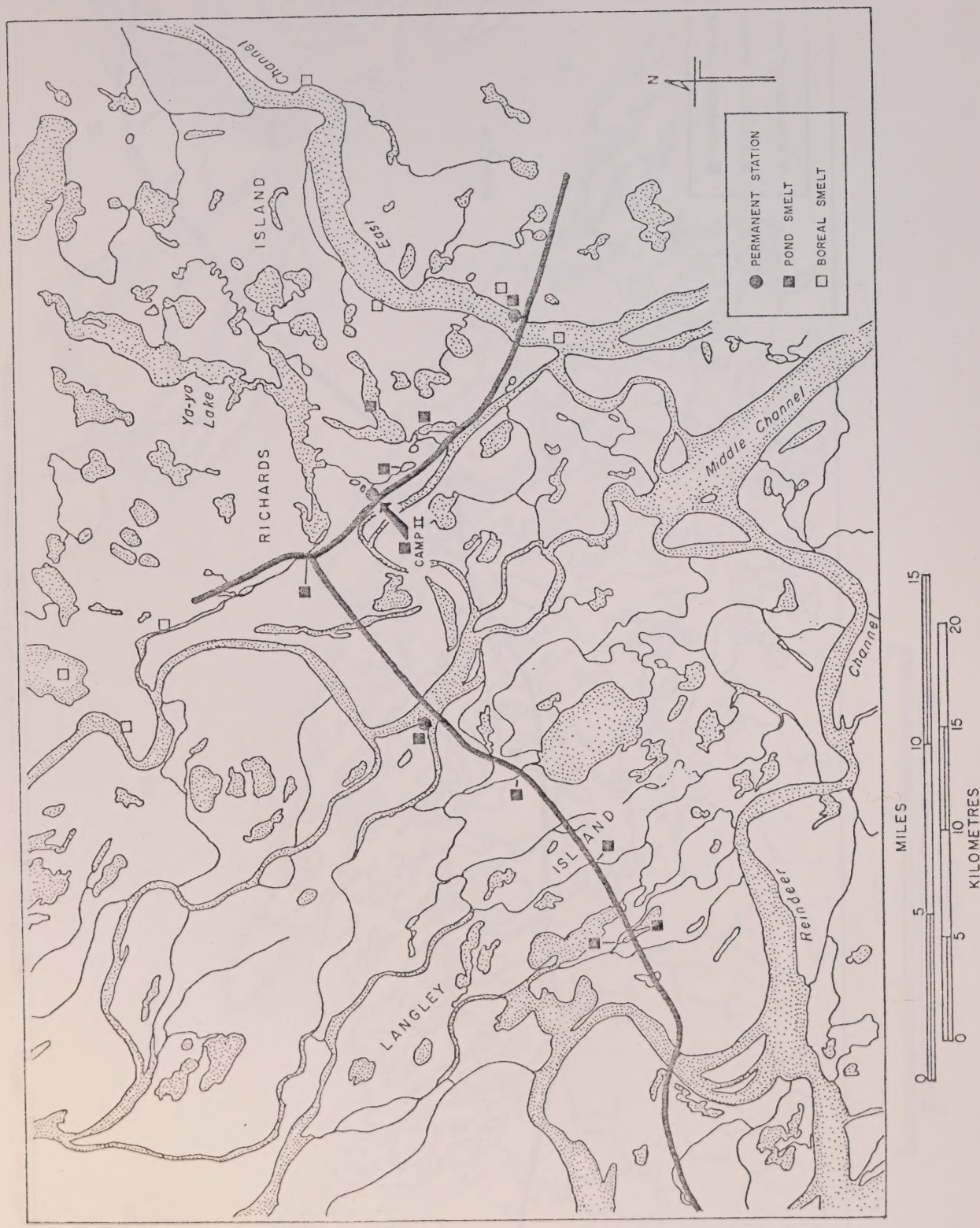

Channel
ISLAND
Ya-yo Lake
RICHARDS
East
CAMP II
Middle Channel
Channel
ISLAND
Reindeer
LANGLEY
N
PERMANENT STATION
POND SMELT
BOREAL SMELT
MILES
KILOMETRES
0
5
10
15
5
10
15
20

FIGURE 12b

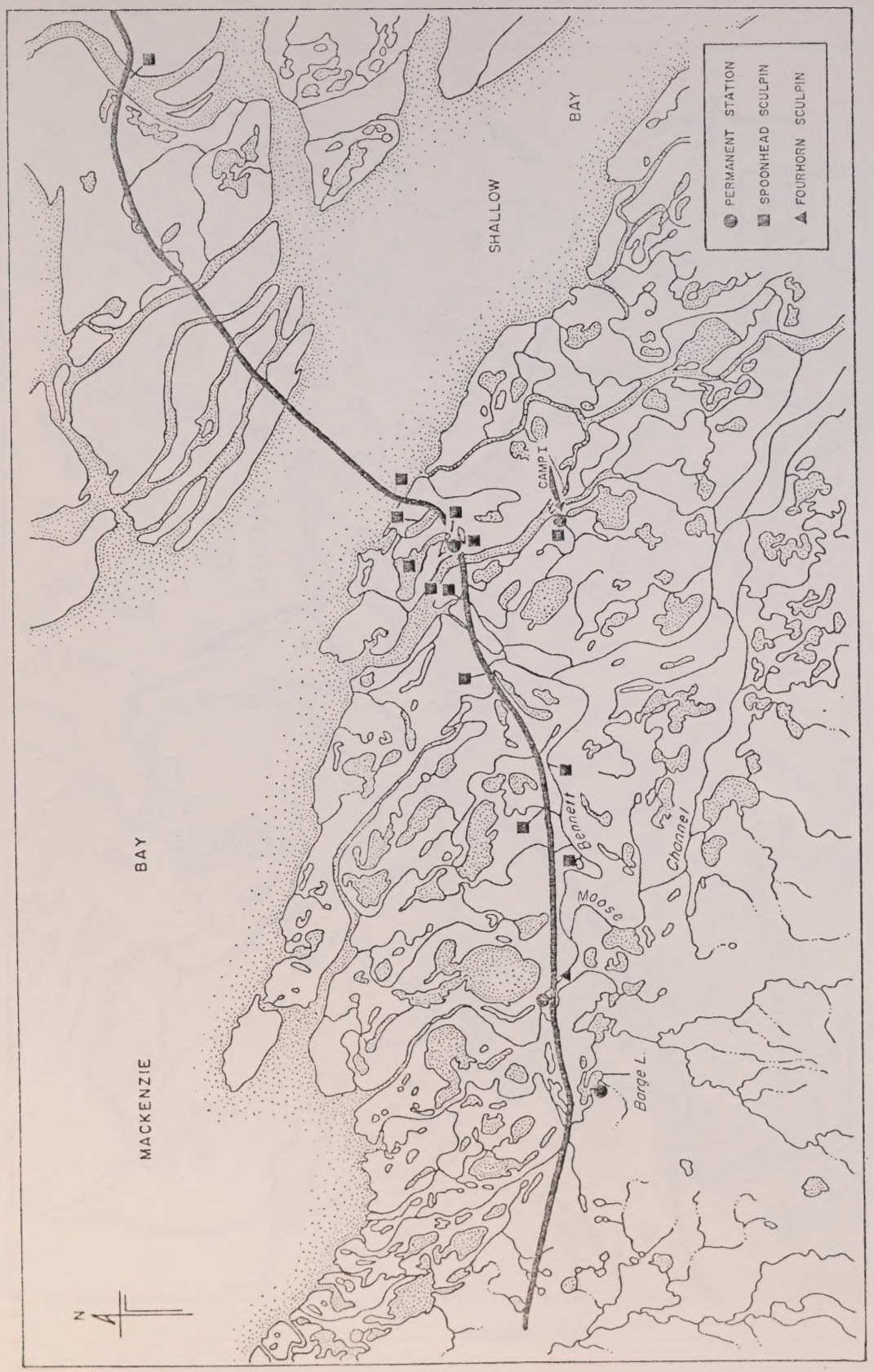

MACKENZIE
BAY
SHALLOW
BAY
CAMPI
Bennett
Moose
Channel
Barge L.
PERMANENT STATION
SPOONHEAD SCULPIN
FOURHORN SCULPIN
N
MILES
KILOMETRES
0
5
10
15
0
5
10
15
20

FIGURE 13a

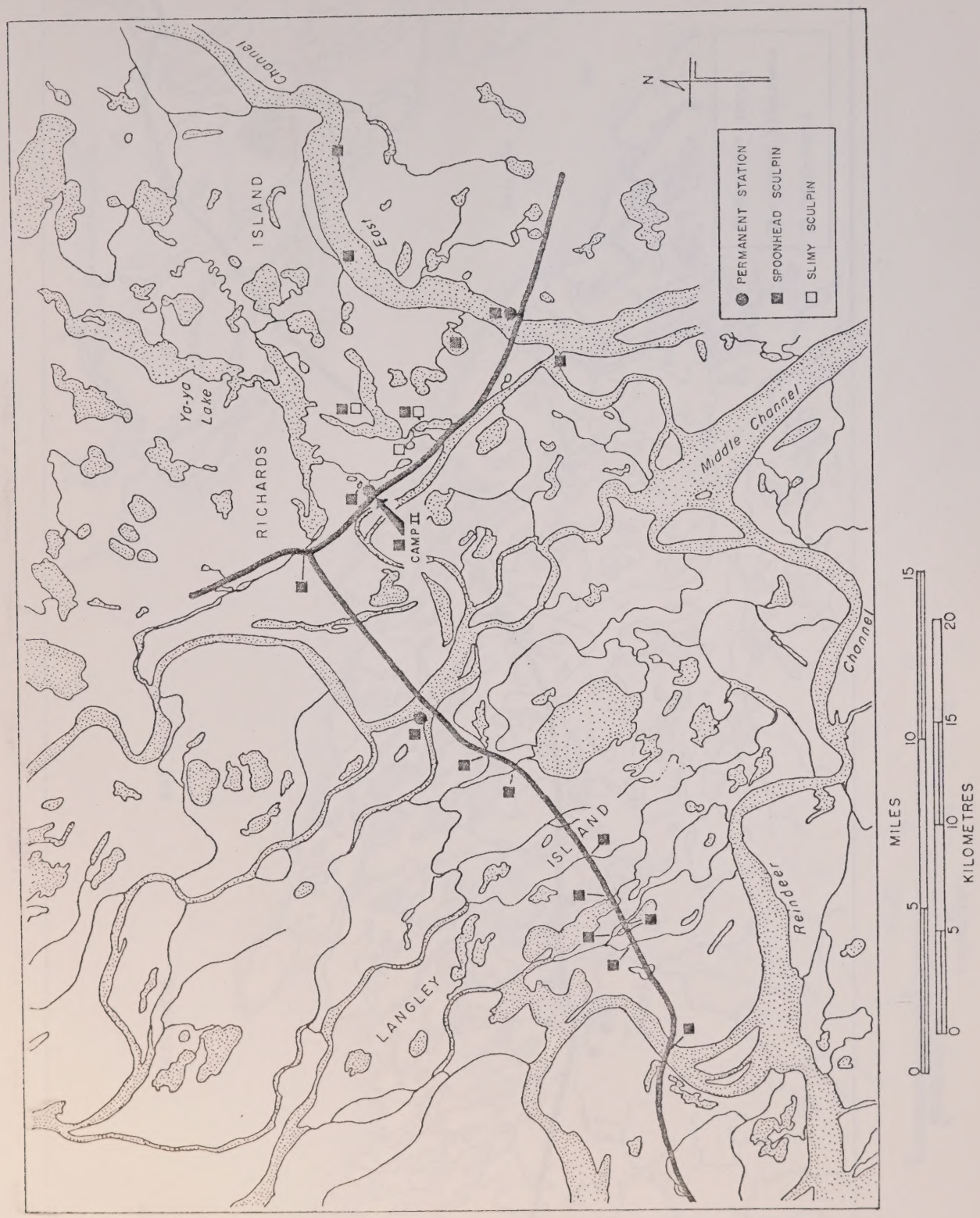

Channel
ISLAND
Yo-yo Lake
RICHARDS
CAMP II
Middle Channel
Channel
ISLAND
Reindeer
LANGLEY
N
PERMANENT STATION
SPOONHEAD SCULPIN
SLIMY SCULPIN
MILES
KILOMETRES
0
5
10
15
20

FIGURE 13b

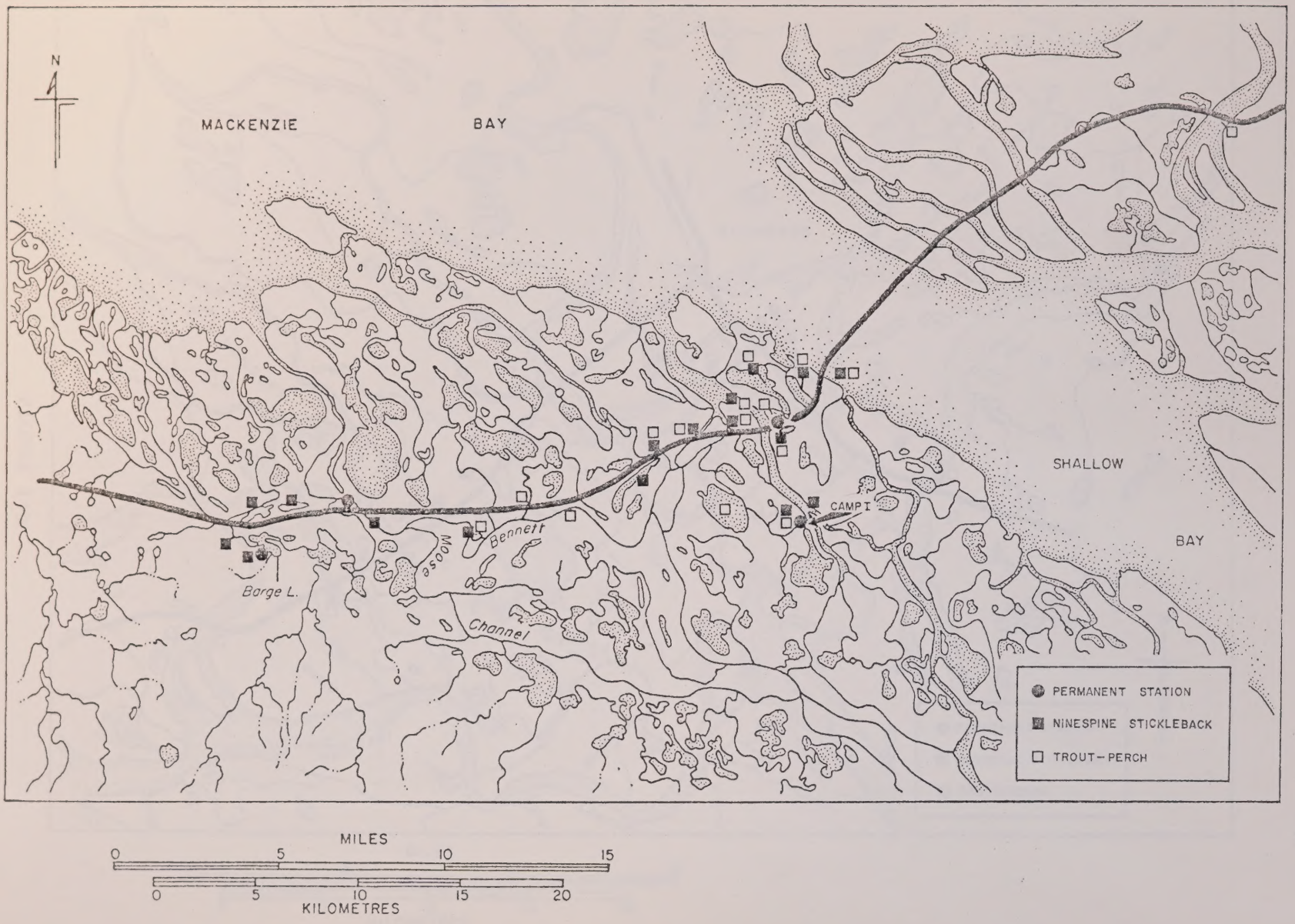

N
MACKENZIE
BAY
SHALLOW
BAY
CAMP I
Bennett
Moose
Channel
Borge L.
PERMANENT STATION
NINESPINE STICKLEBACK
TROUT-PERCH
MILES
0
5
10
15
0
5
10
15
20
KILOMETRES

FIGURE 14a

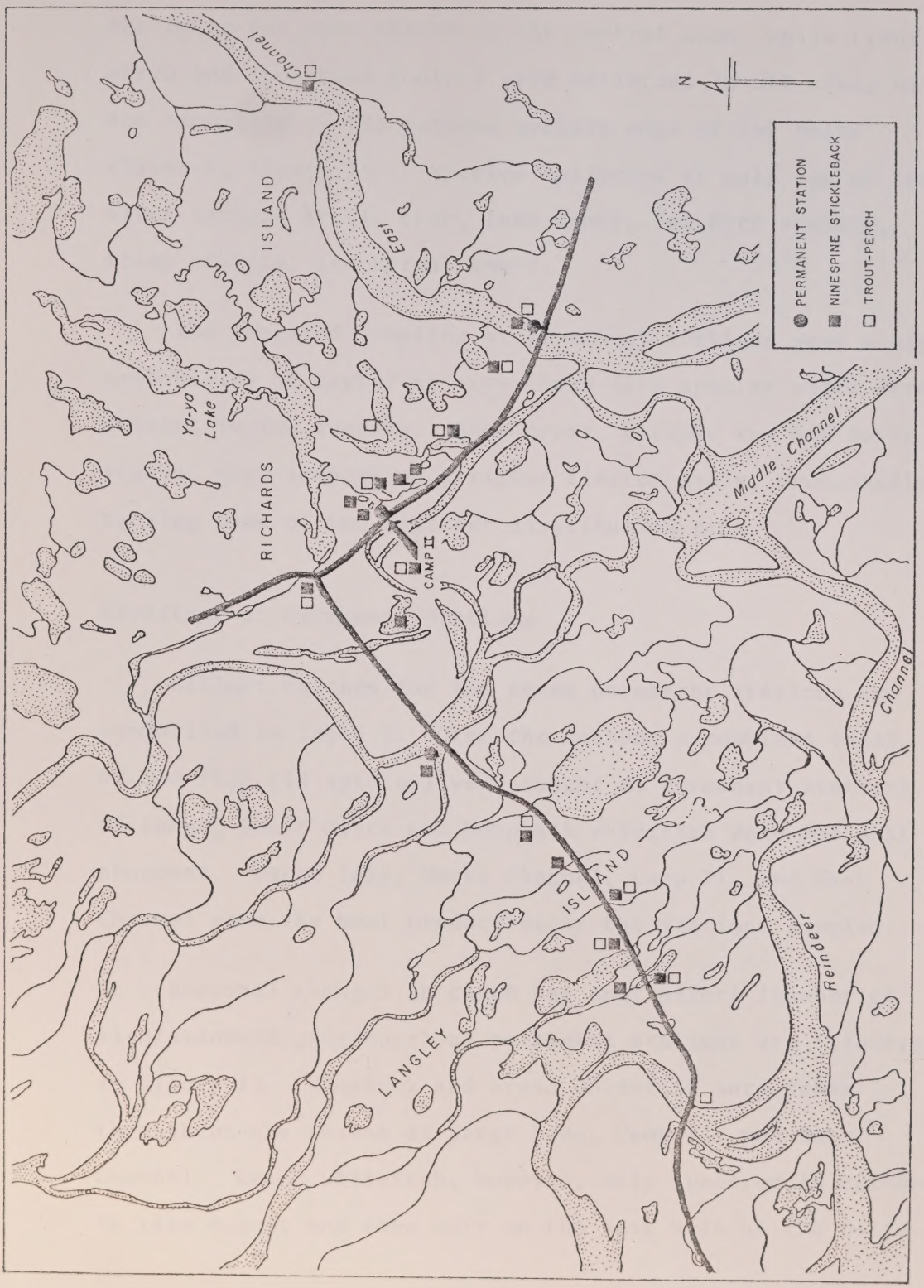

Channel
ISLAND
Yo-yo Lake
RICHARDS
East
CAMP II
Middle Channel
Channel
ISLAND
LANGLEY
Reindeer
N
PERMANENT STATION
NINESPINE STICKLEBACK
TROUT-PERCH
MILES
0
5
10
15
KILOMETRES
0
5
10
15
20

FIGURE 14b

the Delta but were absent in the central area, while trout-perch and spoonhead sculpin were collected in all areas with the exception of the extreme western edge of the Delta (Table 4, Figure 13). Species collected at only one or two sites include Arctic char, lake trout, fourhorn sculpin, slimy sculpin, and boreal smelt.

The repeated sampling at permanent stations gave a high probability of capturing even those fish species which were present in low numbers. Some areas, notably the mid-Delta region, were sampled on a rather limited basis, undoubtedly causing some of the apparent distribution gaps.

Abundance at Permanent Stations

Gillnet catches for the seven permanent stations are summarized in Table 5. Over the season, a combined total of 510 fish (13 species) were caught at permanent stations. Of these, least cisco and humpback whitefish were the most abundant. Barge Lake, Moose Channel, Camp II, and East Channel were the most productive of the stations sampled.

Seasonal changes in catch per unit effort (number of fish/standard gang/hour) at permanent stations are illustrated in Figure 15. Humpback and broad whitefish were taken throughout the season at Barge Lake, Camp II, and East Channel. Round whitefish, however, only appeared in catches in late August and then only on the west side of the Delta

TABLE 5. Seasonal abundance of fish species collected in 24 hour gillnet sets Permanent Stations in the Mackenzie Delta during 1975.

Station	Date	SPECIES												
		INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	BORS	PIKE	LKCB	LNSK	BURB	SPSC	Total
Barge Lake	10 July	5	7	11						2					25
	1 Aug.	4	2	2	3	1				5					17
	10 Aug.	5	8	4	1					1					19
	22 Aug.	4	15	4											23
	2 Sept.	2	7		1		2						1		13
	14 Sept.	5	9	4	3										21
	TOTAL	25	48	25	8	1	2			8			1		118
Moose Channel	10 July	2	1	1						1		1			5
	23 July		1			1									2
	1 Aug.	1	1	1		2									6
	10 Aug.					3							1		4
	22 Aug.	2	4					3		2					11
	2 Sept.	1	1		1		3	2							8
	14 Sept.	7	4	1	15		2			3					32
	TOTAL	13	12	3	16	6	5	5		6		1	1		68
West Channel	5 July	1													1
	16 July	1													1
	26 July														0
	8 Aug.		1									1			2
	16 Aug.		2							1		1			4
	26 Aug.				1								1		2
	8 Sept.									1					1
	18 Sept.	6	1												7
	TOTAL	8	4		1					2		2	1		18

(Continued)

TABLE 5. Continued.

Station	Date	SPECIES												Total
		INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	BORS	PIKE	LKCB	LNSK	BURB	SPSC	
Junction of West and Anderton Channels at Camp I	28 July	1	1			3									5
	8 Aug.	1	2	1		1									5
	20 Aug.			2			1								3
	30 Aug.				1							1			2
	12 Sept.			1	2										3
	20 Sept.		3		1	1				2					7
	TOTAL	2	6	4	4	5	1			2		1			25
Langley Channel	7 July											1			1
	22 July											1	1		2
	6 Aug.		1												1
	16 Aug.		1												1
	25 Aug.		1												1
	5 Sept.	1	1												2
	15 Sept.		2		1										3
	TOTAL	1	6		1							2	1		11
South Ya Ya Channel at Camp II	3 July	1	3	2	2					3					11
	14 July	1	2	2	3					1		1			10
	23 July		5		1					1					7
	2 Aug.		2	1	1					1		1		1	7
	13 Aug.	1	3	1	2					2		1			10
	22 Aug.		5	1	3					3		1			13
	3 Sept.	1	3	1	2						1				8
	14 Sept.	1	6		8					3	1				19
	TOTAL	5	29	8	22					14	2	4		1	85

(Continued)

TABLE 5. Continued.

Station	Date	SPECIES													Total
		INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	BORS	PIKE	LKCB	LNSK	BURB	SPSC	
East Channel	5 July			1	1					2			1		5
	15 July	1	2	2	2				2	1					10
	25 July		5		1					3					9
	4 Aug.		9	2		1				3	1				16
	14 Aug.		6	6	10					2					24
	24 Aug.		2	5	5					1		1			14
	4 Sept.		2	3	6					5					16
	13 Sept.		5	3	77					5			1		91
	TOTAL	1	31	22	102	1			2	22	1	1	2		185
	GRAND TOTAL	55	136	62	154	13	8	5	2	54	3	11	6	1	510

Figure 15. Seasonal catches in catch per unit effort (number of fish/ standard gang/hour) for various species at permanent stations in the Mackenzie Delta, 1975. Catch data have been multiplied by 1,000 to eliminate decimals.

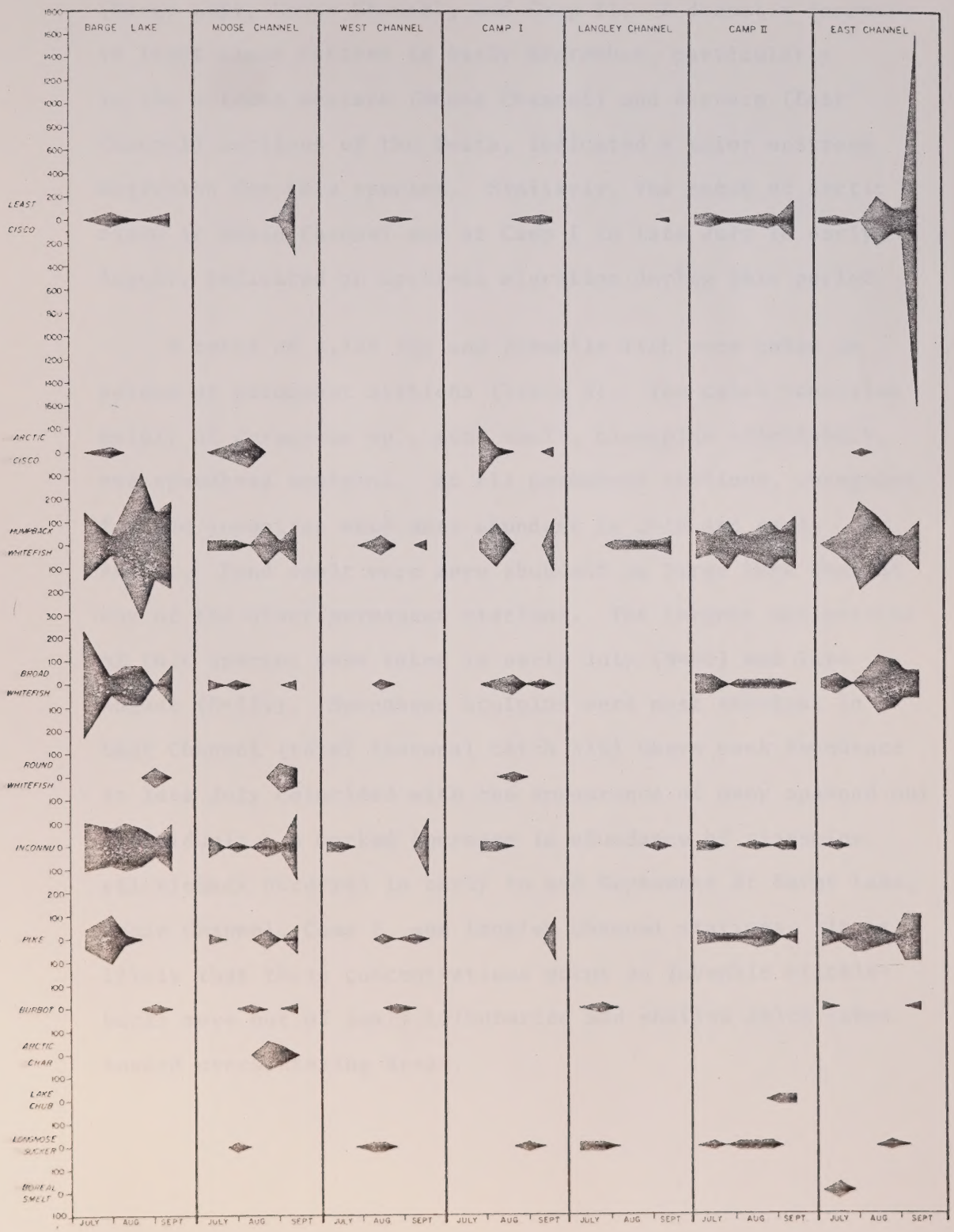

BARGE LAKE
MOOSE CHANNEL
WEST CHANNEL
CAMP I
LANGLEY CHANNEL
CAMP II
EAST CHANNEL
LEAST CISCO
ARCTIC CISCO
HUMPBACK WHITEFISH
BROAD WHITEFISH
ROUND WHITEFISH
INCONNU
PIKE
BURBOT
ARCTIC CHAR
LAKE CHUB
LONGNOSE SUCKER
RAINBOW SMELT
JULY
AUG
SEPT

FIGURE 15

(Barge Lake, Moose Channel, and Camp I). A dramatic increase in least cisco catches in early September, particularly in the extreme western (Moose Channel) and eastern (East Channel) portions of the Delta, indicated a major upstream migration for this species. Similarly, the catch of Arctic cisco in Moose Channel and at Camp I in late July to early August, indicated an upstream migration during this period.

A total of 4,436 fry and juvenile fish were taken in seines at permanent stations (Table 6). The catch consisted mainly of *Coregonus* sp., pond smelt, ninespine stickleback, and spoonhead sculpins. At all permanent stations, coregonid fry and juveniles were most abundant in July and early August. Pond smelt were more abundant in Barge Lake than at any of the other permanent stations. The largest collections of this species were taken in early July (N=96) and late August (N=431). Spoonhead sculpins were most abundant in East Channel (total seasonal catch 336) where peak abundance in late July coincided with the appearance of many spawned-out individuals. A marked increase in abundance of ninespine stickleback occurred in early to mid September at Barge Lake, Moose Channel, Camp I, and Langley Channel stations. It is likely that these concentrations occur as juvenile sticklebacks move out of small tributaries and shallow delta lakes toward overwintering areas.

TABLE 6. Seasonal abundance of fish species captured by seine at Permanent Stations in the Mackenzie Delta, 1975. CRSP, unidentified *Coregonus* species.

Station	Date	SPECIES													Total
		ARLM	INCO	CRSP	LSCS	ARCS	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	FHSC	SPSC	
Barge Lake	10 July			27	4		96					1				128
	1 Aug.			3			22						2			27
	10 Aug.			5	7		9									21
	22 Aug.			16	1		431						1			449
	2 Sept.			25	16		13	1					251			306
	14 Sept.				1		5	1					17			24
	TOTAL			76	29		576	2				1	271			955
Moose Channel	10 July			38	5		2			1						46
	23 July			79	1	1	7	7				3	2			100
	1 Aug.		1	9									1			11
	10 Aug.				9		20					1	59			89
	22 Aug.			8	8		8						22	3		49
	2 Sept.			9	5								8	1		23
	14 Sept.			1	1								30			32
	TOTAL		1	144	29	1	37	7		1		4	122	4		350
West Channel	5 July			8	1					2	1				2	14
	16 July			1	1		1					6			3	12
	26 July			1	2				2	20	2	1			5	33
	8 Aug.				7					3			3		1	14
	16 Aug.				5								3			8
	26 Aug.			2	1					2					6	11
	8 Sept.			1	1							1	16			19
	18 Sept.			2						3			69		1	75
	TOTAL			15	18		1		2	30	3	8	91		18	186

(Continued)

TABLE 6. Continued.

Station	Date	SPECIES ARLM	INCO	CRSP	LSCS	ARCS	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	FHSC	SPSC	Total
Junction	28 July			3						5	1		1		1	11
of West	8 Aug.			6	6		5		1	2			28		2	50
and	16 Aug.			6	2		2			2	1		106		5	124
Anderton	20 Aug.			2						13	4				3	22
Channels	30 Aug.			1	10		4					1			2	18
at Camp I	12 Sept.			2	16		6						412			436
	20 Sept.			1	2					3						6
	TOTAL			21	36		17		1	25	6	1	547		13	667
Langley	7-8 July											1			4	5
Channel	21 July														2	2
	6 Aug.														2	2
	16 Aug.															0
	25 Aug.	1													1	2
	5 Sept.			1									1			2
	15 Sept.			1			1		1				1627			1630
	TOTAL	1		2			1		1			1	1628		9	1643
South Ya	3 July										12					12
Ya Channel	14 July									2	2	3			6	13
at Camp	23 July			2							13	4	1		15	35
II	2-3 Aug.			1						2		1	1		9	14
	13 Aug.			1						3	8				2	14
	22-23 Aug.									1	1				10	12
	3 Sept.							3		1	7				3	14
	14 Sept.						1	2	1			1	11		1	17
	TOTAL			4			1	5	1	9	43	9	13		46	131

(Continued)

TABLE 6. Continued.

Station	Date	SPECIES ARLM	INCO	CRSP	LSCS	ARCS	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	FHSC	SPSC	Total
East Channel	4 July			2											18	20
	14 July										2	1			63	66
	24 July		1	1			17	1		2		1	14		91	128
	4 Aug.			2			1			1	2		4		49	59
	14 Aug.				1		3			5	4		5		14	32
	23-24 Aug.						37	1		2	6	1	3		61	111
	3-4 Sept.			8			1	1					11		30	51
	12-13 Sept.						4	2		7			15		10	38
	TOTOAL		1	13	1		63	5		17	14	3	52		336	505
	GRAND TOTAL	1	1	275	113	1	696	19	5	82	66	27	2724	4	422	4437

Abundance at Survey Stations

A total of 333 fish (12 species) was collected by gillnet at 42 survey stations during 1975 (Table 7). The most abundant species were humpback whitefish (N=101), pike (N=58), and least cisco (N=55). In general, except during major migrations, fish were more abundant in lakes than in channels. This observations may have been affected to some degree by the possible lower efficiency of channel sets brought about by a more rapid clogging by debris than occurred in lake sets. Some species (e.g. inconnu) were never abundant but were captured consistently throughout the summer at most locations. Other species (e.g. Arctic char and Arctic cisco) were collected only during migrations.

In terms of catch per unit effort, seine samples collected at survey sites are not quantitatively comparable due to wide variation in substrate consistency and bank slope which, in some cases, severely limited seine efficiency.

Over the course of the summer, a total of 2,224 fish (15 species) was collected by seine (Table 8). The most abundant species were ninespine stickleback (826), unidentified coregonids (351), and longnose sucker (283).

Several of the sample sites appear to be important rearing areas (Table 8). For example, sites 18, 19, 27, and 28 are important longnose sucker rearing areas; sites 13 and 15 are important burbot rearing areas; and coregonid fry

TABLE 7. Numbers of fish species collected and catch per unit effort by standard gillnet at Survey Stations in the Mackenzie Delta during 1975.

Stn.	Date	Hours Set	Total Catch	Catch per net hr.	SPECIES										
					INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	PIKE	LNSK	TRPH	BURB	SPSC
1	22 July	4	11	2.75	1	9						1				
	10 Aug.	5	3	0.60	1	2										
2	23 July	4	1	0.25			1									
3	23 Aug.	24	8	0.33			5					3				
4	12 Aug.	4	5	1.25	2	3										
5	13 July	4	3	0.75	2							1				
	18 Aug.	7	1	0.14		1										
6	13 July	4	3	0.75	1	2										
	19 Aug.	4	3	0.75		2						1				
7	15 July	4	1	0.25		1										
	18 Aug.	7.5	8	1.07		2	3	1		1		1				
8	12 Aug.	4	2	0.50				2								
	19 Aug.	24	9	0.38			4	2				3				
9	12 Aug.	4	5	1.25	3	1	1									

(Continued)

TABLE 7. Continued.

Stn.	Date	Hours Set	Total Catch	Catch per net hr.	SPECIES INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	PIKE	LNSK	TRPH	BURB	SPSC
10	6 July	4	0	0.0												
	15 July	4	0	0.0												
	31 July	4	0	0.0												
	17 Sept.	4	1	0.25				1								
11	8 July	4	2	0.50	2											
	4 Aug.	4	3	0.75		3										
	5 Sept.	4.5	5	1.11	3						2					
12	8 July	4	3	0.75	1	1							1			
	4 Aug.	4.5	8	1.78	2	2	1					2				1
	5 Sept.	4	3	0.75		1		1		1						
13	20 July	4	1	0.25			1									
14	21 July	4	0	0.0												
15	12 July	6	1	0.17	1											
	13 Aug.	4	2	0.50	2											
16	17 July	4	1	0.25										1		
	14 Aug.	4	5	1.25	3	2										
17	31 Aug.	4	1	0.25		1										

(Continued)

TABLE 7. Continued.

Stn.	Date	Hours Set	Total Catch	Catch per net hr.	SPECIES										
					INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	PIKE	LNSK	TRPH	BURB	SPSC
18	17 July	4	1	0.25		1										
	28 Aug.	6	0	0.0												
19	27 July	5	2	0.40	2											
	28 Aug.	6	6	1.00		2		1				2	1			
20	7 July	24	0	0.0												
	18 July	24	0	0.0												
	29 July	24	2	0.08		1									1	
	9 Aug.	12	0	0.0												
	10 Sept.	6	3	0.50		1			1			1				
21	14 July	4	0	0.0												
	3 Aug.	4	0	0.0												
	14 Aug.	1	0	0.0												
22	20 Aug.	4	0	0.0												
23	5 Aug.	4	3	0.75					1			1	1			
	20 Aug.	4	2	0.5				1	1							
24	9 Aug.	4	0	0.0												
25	9 Aug.	4	0	0.0												

(Continued)

TABLE 7. Continued.

Stn.	Date	Hours Set	Total Catch	Catch per net hr.	SPECIES										
					INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	PIKE	LNSK	TRPH	BURB	SPSC
26	19 July	4	1	0.25											1	
	10 Sept.	4	0	0.0												
27	19 July	5.5	2	0.36								1	1			
	10 Sept.	5	2	0.40	1	1										
28	12 July	4	3	0.75	1	1		1								
	17 Sept.	4.5	2	0.44	1							1				
29	12 July	4	12	3.0		2	6					4				
	11 Sept.	4.5	0	0.0												
30	9 July	2.5	0	0.0												
	30 July	4	4	1.0				1					3			
31	9 July	4	0	0.0												
	30 July	4	0	0.0												
32	17 Sept.	7	16	2.29			16									
33	8 Aug.	5	0	0.0												
	31 Aug.	4	5	1.25		3		2								
	18 Sept.	4	14	3.5	2	4	3	4				1				
34	27 July	4	0	0.0												
	30 Aug.	4	1	0.25		1										

(Continued)

TABLE 7. Continued.

Stn.	Date	Hours Set	Total Catch	Catch per net hr.	SPECIES INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	PIKE	LNSK	TRPH	BURB	SPSC
35	17 Aug.	4	5	1.25		4						1				
36	18 Sept.	4.5	2	0.44		2										
37	27 Aug.	4	1	0.25			1									
38	25 July	4	9	2.25	1	4		1				3				
	11 Aug.	4	4	1.0		3						1				
	1 Sept.	4	7	1.75	2	3	1					1				
39	6 July	4	17	4.25	6	2		7				2				
	17 July	4	14	3.50	1	5		4				4				
	31 July	4	1	0.25		1										
	18 Aug.	4	2	0.50		1	1									
	18 Aug.	4	15	3.75	1	6	1	2				5				
	9 Sept.	4	3	0.75				1				2				
40	26 July	4	1	0.25		1										
	19 Aug.	4	6	1.50		3	2					1				
41	11 July	3.5	7	2.0	1	2	1	3								
	20 July	4	9	2.25	3	5						1				
	15 Aug.	4	11	2.75	2	2	1	1				5				
	2 Sept.	4	6	1.50		2		2				2				
	20 Sept.	4	6	6.25	1	4		17				3				

(Continued)

TABLE 7. Continued.

Stn.	Date	Hours Set	Total Catch	Catch per net hr.	SPECIES											
					INCO	HMWT	BDWT	LSCS	ARCS	RDWT	CHAR	PIKE	LNSK	TRPH	BURB	SPSC
42	11 July	4.5	3	0.67								3				
	28 Aug.	4		1.25	1	1	2					1				
LAKES	Total	240	226		33	64	38	43	0	0	0	45	2	1	0	0
N=25	Catch per net hr.		0.942		0.138	0.267	0.158	0.179	0	0	0	0.188	0.008	0.004	0	0
CHANNELS	Total	138	102		17	35	13	12	2	2	2	12	5	0	1	1
N=15	Catch per net hr.		0.737		0.123	0.254	0.094	0.014	0.014	0.014	0.014	0.087	0.036	0	0.007	0.007
GRAND TOTAL*		477	333	0.70	50	101	51	55	3	2	2	58	7	1	2	1
	Catch per net hr.				0.105	0.212	0.107	0.115	0.006	0.004	0.004	0.122	0.015	0.002	0.004	0.002

*Includes Shallow Bay samples. (99 net hours at Stations 20 and 21).

TABLE 8. Number of fish species collected by seine at Survey Stations in the Mackenzie Delta during 1975. CRSP, unidentified *Coregonus* species.

Stn.	Date	No. Hauls	SPECIES														
			ARLM	INCO	HMWT	LSCS	ARCS	CRSP	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	SLSC	SPSC	Total
1	22 July	5				4		6		2								12
	10 Aug.	5				15	1	5	3						62			86
2	23 July	5				4		4							2			10
3	23 Aug.	5													81			81
5	13 July	5						7	2				3		2		5	19
	18 Aug.	5				3		10	3	1				2			13	32
6	13 July	5											1	1				2
	19 Aug.	5						3									1	4
7	15 July	5							4	1			8	3			1	17
	18 Aug.	5				1				1							2	4
8	19 Aug.	3							24	1					76			101
10	6 July	5						7						1				8
	15 July	5						1		2			1	4			7	15
	31 July	5				6		6				1					1	14
	17 Sept.	5				6		1	8				1	3	146			165
11	8 July	3						5		1			1					7
	4 Aug.	5						30				11						41
	5 Sept.	5				1		3	1						14			19

(Continued)

TABLE 8. Continued.

Stn.	Date	No. Hauls	SPECIES															
			ARLM	INCO	HMWT	LSCS	ARCS	CRSP	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	SLSC	SPSC	Total
12	8 July	5						6	11	1		2	12	2				34
	4 Aug.	5						19	2			1	3				4	29
	5 Sept.	4				14									24			38
13	20 July	5							1				1	17				19
14	21 July	5													113			113
15	12 July	5						3				4	17	33				57
	13 Aug.	5			2	7		3	1			3		3	11		5	35
17	31 Aug.	5				14		10	2			1			26		2	55
18	17 July	5				3	6	5	1				7	5			1	28
	28 Aug.	5				7		76		1		26	3	5	32		20	170
19	27 July	5					2	2		3	1	153	8		1		15	185
	28 Aug.	5				2		21	3			9	7		14			56
20	7 July	5						8					1					9
	18 July	5						3	2	1			1	1				8
	29 July	5						3				5	6		1		14	29
	30 July	5															12	12
	9 Aug.	5				3		8				1	1		4			17
22	20 Aug.	2		1				1										2

(Continued)

TABLE 8. Continued.

Stn.	Date	No. Hauls	SPECIES														
			ARLM	INCO	HMWT	LSCS	ARCS	CRSP	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	SLSC	SPSC	Total
23	20 Aug.	2		1				2				2	1	1			1	8
24	9 Aug.	2										2					1	3
25	9 Aug.	2						1	30	1		2	1				2	37
26	19 July	4																0
	10 Sept.	2						1	2						2		6	11
27	19 July	3		2						1		3	5	4	1		1	17
	10 Sept.	2				2		4				20			21			47
28	12 July	4		2				1	1									4
	17 Sept.	2								1		10	1		5		1	18
29	12 July	2								10					6			16
	11 Sept.	2								1					85			86
30	9 July	2							4				5	1			16	26
	30 July	2				1			4			5		2	3		6	21
31	9 July	2												1			2	3
	30 July	2	1														8	9
32	16 Sept.	2													12			12

(Continued)

TABLE 8. Continued.

Stn.	Date	No. Hauls	SPECIES													
			ARLM	INCO	HMWT	LSCS	ARCS	CRSP	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	SLSC	SPSC	Total
33	8 Aug.	2						1					5		1		7	14
	31 Aug.	2				3		1					2				2	8
	18 Sept.	2											15		15			30
34	27 July	2						5		2		2			1		2	12
	30 Aug.	2				1				4					2			7
35	17 Aug.	2													8			8
36	18 Sept.	2																0
37	27 Aug.	2				1			16						2			19
38	25 July	3				4		54		5				1	30			94
	11 Aug.	2				1		4	16									21
	1 Sept.	2				2									4			6
39	6 July	2						6	2				2			2		9
	17 July	2										4	2			2	1	7
	31 July	2						5								2		7
	18 Aug.	2						1				1				4	1	7
	9 Sept.	3							1			1		1		1		4
40	26 July	3						1				5			6	2		14
	19 Aug.	2						4				2			9	6		21

(Continued)

TABLE 8. Continued.

Stn.	Date	No. Hauls	SPECIES															
			ARLM	INCO	HMWT	LSCS	ARCS	CRSP	PONS	PIKE	LKCB	LNSK	TRPH	BURB	NNST	SLSC	SPSC	Total
41	20 July	2							12			2	12	1	1		2	30
	15 Aug.	2						2	4			1			1	2		10
	2 Sept.	5										1	1				4	6
	20 Sept.	2										3		2	1	5		11
42	11 July	3				6							2				4	12
	28 Aug.	3				8		2							1			11
	TOTALS		1	6	2	119	9	351	160	40	1	283	136	94	826	26	170	2224

and juveniles were abundant at sites 11, 12, 17, 18, 19, 37, and 38.

Size Distribution, Sex, and Maturity

Figure 16 presents the length frequency distribution of species captured in the study area. The length ranges of most fish were similar to those reported for the Mackenzie River system by Hatfield et al. (1972) and Stein et al. (1973). Since life history analyses on individual fish species are incomplete, a more comprehensive discussion will be included in the final report.

Males were usually more abundant than females in the smaller size classes (younger fish), but females were more numerous in larger size classes (older fish). Overall, there were no significant departures from expected 1:1 sex ratios except for least cisco, where males were considerably more abundant than females (Table 9).

Individuals of most of the major species had matured by the time they had grown to 300-400 mm (Table 9). Exceptions were the least cisco which matured at shorter lengths (150-200 mm) and the inconnu which matured at greater lengths (>600 mm).

TABLE 9. Sex and maturity ratios (by size class) for major fish species captured in the Mackenzie Delta, 1975.

Fork Length (mm)	Inconnu							
	Males			Females				
	N	%	% Mature	N	%	% Mature	Unsexed	Total
<50	0	-	-	0	-	-	6	6
50-74	0	-	-	0	-	-	9	9
75-99	0	-	-	0	-	-	2	2
100-124	0	-	-	0	-	-	1	1
125-149	2	100	0	0	-	-	1	3
150-174	0	-	-	0	-	-	0	0
175-199	1	100	0	0	-	-	0	1
200-224	0	-	-	0	-	-	1	1
225-249	0	-	-	0	-	-	0	0
250-274	0	-	-	2	100	0	0	2
275-299	0	-	-	1	100	*	0	1
300-324	1	50	0	1	50	0	0	2
325-349	2	67	0	1	33	0	0	3
350-374	1	100	*	0	-	-	2	3
375-399	1	50	0	1	50	0	0	2
400-424	1	20	*	4	80	0	0	5
425-449	3	75	0	1	25	0	0	4
450-474	3	100	0	0	-	-	0	3
475-499	3	60	25	2	40	0	0	5
500-524	6	75	0	2	25	0	0	8
525-549	2	33	0	4	67	0	0	6
550-574	3	38	0	4	62	0	0	7
575-599	3	38	0	4	62	25	0	7
600-624	6	75	17	2	25	0	0	8
625-649	4	50	50	4	50	0	0	8
650-674	8	67	50	4	33	50	1	13
675-699	2	33	50	4	67	75	0	6
700-724	1	50	100	1	50	100	0	2
725-749	0	-	-	2	100	100	0	2
750-774	0	-	-	2	100	100	0	2
775-799	1	100	0	0	-	-	0	1
800-824	0	-	-	2	100	100	0	2
825-849	1	100	*	0	-	-	0	1
850-874	0	-	-	0	-	-	0	0
875-899	0	-	-	1	100	100	0	1
900-924	0	-	-	0	-	-	0	0
925-949	0	-	-	0	-	-	0	0
950-974	0	-	-	0	-	-	0	0
975-999	0	-	-	0	-	-	0	0
>1000	0	-	-	0	-	-	0	0
TOTAL	55	53		49	47		23	127

* Maturity not determined

TABLE 9. Continued.

Fork Length (mm)	Least cisco Males N	Males %	Males % Mature	Females N	Females %	Females % Mature	Unsexed	Total
<50	2	100	0	0	-	-	32	34
50-74	15	100	0	0	-	-	129	144
75-99	9	82	0	2	18	50	17	28
100-124	3	60	67	2	40	0	4	9
125-149	3	100	67	0	-	-	3	6
150-174	1	100	100	0	-	-	1	2
175-199	6	60	33	4	40	100	6	16
200-224	18	60	89	12	40	100	1	31
225-249	25	69	100	11	31	64	1	37
250-274	42	78	98	12	22	83	3	57
275-299	20	49	100	21	51	81	0	41
300-324	2	20	100	3	60	100	0	5
325-349	0	-	-	4	100	75	0	4
350-374	0	-	-	0	-	-	0	0
375-399	0	-	-	0	-	-	0	0
400-424	0	-	-	0	-	-	0	0
425-449	0	-	-	0	-	-	0	0
450-474	0	-	-	0	-	-	0	0
475-499	0	-	-	0	-	-	0	0
>500	0	-	-	0	-	-	0	0
TOTAL	146	70		71	30		197	414
			Arctic cisco					
<50	0	-	-	0	-	-	5	5
50-74	0	-	-	0	-	-	3	3
75-99	0	-	-	0	-	-	0	0
100-124	0	-	-	0	-	-	0	0
125-149	0	-	-	0	-	-	0	0
150-174	0	-	-	0	-	-	0	0
175-199	0	-	-	0	-	-	0	0
200-224	0	-	-	0	-	-	0	0
225-249	0	-	-	0	-	-	0	0
250-274	0	-	-	0	-	-	0	0
275-299	0	-	-	0	-	-	0	0
300-324	0	-	-	1	100	0	0	1
325-349	3	60	100	2	40	50	1	6
350-374	3	60	100	2	40	*	0	5
375-399	0	-	-	1	100	100	0	1
400-424	2	50	100	0	0	-	0	2
425-449	0	-	-	0	-	-	0	0
450-474	0	-	-	0	-	-	0	0
475-499	0	-	-	0	-	-	0	0
>500	0	-	-	0	-	-	0	0
TOTAL	8	57		6	43		9	23

* Maturity not determined.

TABLE 9. Continued.

Fork Length (mm)	Humpback whitefish: Males N	Males %	Males % Mature	Females N	Females %	Females % Mature	Unsexed	Total
<50	0	-	-	0	-	-	0	0
50-74	0	-	-	0	-	-	2	2
75-99	3	100	0	0	-	-	3	6
100-124	7	13	0	1	87	0	14	22
125-149	2	67	0	1	33	0	10	13
150-174	5	50	0	5	50	0	4	14
175-199	3	50	0	3	50	0	2	8
200-224	6	83	0	1	17	0	2	9
225-249	5	56	0	4	44	0	1	10
250-274	11	58	18	8	42	13	2	21
275-299	5	62	0	3	38	0	1	9
300-324	8	62	0	5	38	0	2	15
325-349	10	50	0	10	50	0	0	20
350-374	10	67	10	5	33	20	1	16
375-399	11	48	36	12	52	33	0	23
400-424	12	60	58	8	40	100	0	20
425-449	12	46	91	14	54	86	0	26
450-474	3	38	100	5	62	100	2	10
475-499	5	42	80	7	58	100	0	12
>500	1	100	100	0	-	-	0	1
TOTAL	119	57		92	43		46	257
	Broad whitefish							
<50	0	-	-	0	-	-	5	5
50-74	0	-	-	0	-	-	7	7
75-99	2	100	0	0	-	-	4	6
100-124	1	33	0	2	67	0	2	5
125-149	1	100	0	0	-	-	3	4
150-174	2	33	0	1	67	0	0	3
175-199	1	50	0	1	50	0	1	3
200-224	0	-	-	1	100	0	0	1
225-249	0	-	-	1	100	0	0	1
250-274	0	-	-	1	100	*	1	2
275-299	4	50	0	4	50	0	1	9
300-324	7	58	0	5	42	0	3	15
325-349	0	-	-	2	100	0	0	2
350-374	4	33	0	8	67	0	0	12
375-399	3	50	0	3	50	33	0	6
400-424	5	42	100	7	58	14	1	13
425-449	7	71	71	2	29	100	0	9
450-474	3	38	100	5	62	100	0	8
475-499	4	36	100	7	64	100	0	11
>500	6	60	83	4	40	100	1	11
TOTAL	50	48		54	52		29	133

*Maturity not determined.

TABLE 9. Continued.

Fork Length (mm)	Round whitefish Males N	Males %	Males % Mature	Females N	Females %	Females % Mature	Unsexed	Total
<50	0	-	-	0	-	-	0	0
50-74	0	-	-	0	-	-	0	0
75-99	0	-	-	0	-	-	0	0
100-124	0	-	-	0	-	-	0	0
125-149	0	-	-	0	-	-	0	0
150-174	0	-	-	0	-	-	0	0
175-199	1	100	100	0	-	-	0	1
200-224	0	-	-	0	-	-	0	0
225-249	0	-	-	0	-	-	0	0
250-274	0	-	-	0	-	-	0	0
275-299	0	-	-	0	-	-	0	0
300-324	2	40	100	3	60	67	0	5
325-349	4	100	100	0	-	-	0	4
350-374	0	-	-	0	-	-	0	0
375-399	0	-	-	0	-	-	0	0
400-424	0	-	-	0	-	-	0	0
425-449	0	-	-	0	-	-	0	0
450-474	0	-	-	0	-	-	0	0
475-499	0	-	-	0	-	-	0	0
>500	0	-	-	0	-	-	0	0
TOTAL	7	70		3	30		0	10
	Arctic char							
<50	0	-	-	0	-	-	0	0
50-74	0	-	-	0	-	-	0	0
75-99	0	-	-	0	-	-	0	0
100-124	0	-	-	0	-	-	0	0
125-149	0	-	-	0	-	-	0	0
150-174	0	-	-	0	-	-	0	0
175-199	0	-	-	0	-	-	0	0
200-224	0	-	-	0	-	-	0	0
225-249	0	-	-	0	-	-	0	0
250-274	2	100	0	0	-	-	0	2
275-299	1	50	0	1	50	0	0	2
300-324	0	-	-	0	-	-	0	0
325-349	0	-	-	0	-	-	0	0
350-374	0	-	-	0	100	100	0	1
375-399	0	-	-	0	-	-	0	0
400-424	1	100	0	0	100	-	0	1
425-449	1	100	0	0	-	-	0	1
450-474	0	-	-	0	-	-	0	0
475-499	0	-	-	0	-	-	0	0
>500	0	-	-	0	-	-	0	0
TOTAL	5	71		2	29		0	7

TABLE 9. Continued.

Fork Length (mm)	Longnose sucker Males N	%	% Mature	Females N	%	% Mature	Unsexed	Total
<50	0	-	-	0	-	-	263	263
50-74	0	-	-	0	-	-	45	45
75-99	1	100	0	0	-	-	11	12
100-124	1	100	0	0	-	-	8	9
125-149	0	-	-	0	-	-	3	3
150-174	4	100	0	0	-	-	0	4
175-199	0	-	-	0	-	-	3	3
200-224	0	-	-	0	-	-	0	0
225-249	0	-	-	0	100	0	0	1
250-274	0	-	-	1	100	0	0	1
275-299	0	-	-	0	-	-	0	0
300-324	1	100	0	0	-	-	0	1
325-349	0	-	-	0	-	-	0	0
350-374	0	-	-	0	-	-	0	0
375-399	2	100	100	0	-	-	0	0
400-424	1	100	100	0	-	-	0	1
425-449	0	-	-	0	-	-	0	0
450-474	2	100	100	0	-	-	0	2
475-499	2	100	100	0	-	-	0	2
>500	0	-	-	2	100	100	0	2
TOTAL	14	78		4	22		333	351
				Burbot				
<50	0	-	-	0	-	-	89	89
50-74	0	-	-	0	-	-	13	13
75-99	0	-	-	0	-	-	3	3
100-124	0	-	-	1	100	0	2	3
125-149	1	100	0	0	-	-	1	2
150-174	0	-	-	0	-	-	0	0
175-199	1	100	0	0	-	-	1	2
200-224	1	100	*	0	-	-	1	2
225-249	1	50	100	1	50	0	0	2
250-274	0	-	-	0	-	-	1	1
275-299	0	-	-	2	100	0	0	2
300-324	0	-	-	0	-	-	1	1
325-349	0	-	-	0	-	-	0	0
350-374	0	-	-	0	-	-	0	0
375-399	2	100	50	0	-	-	0	2
400-424	0	-	-	0	-	-	0	0
425-449	0	-	-	0	-	-	0	0
450-474	0	-	-	0	-	-	0	0
475-499	0	-	-	0	-	-	0	0
>500	3	50	67	3	50	100	0	6
TOTAL	9	56		7	44		112	128

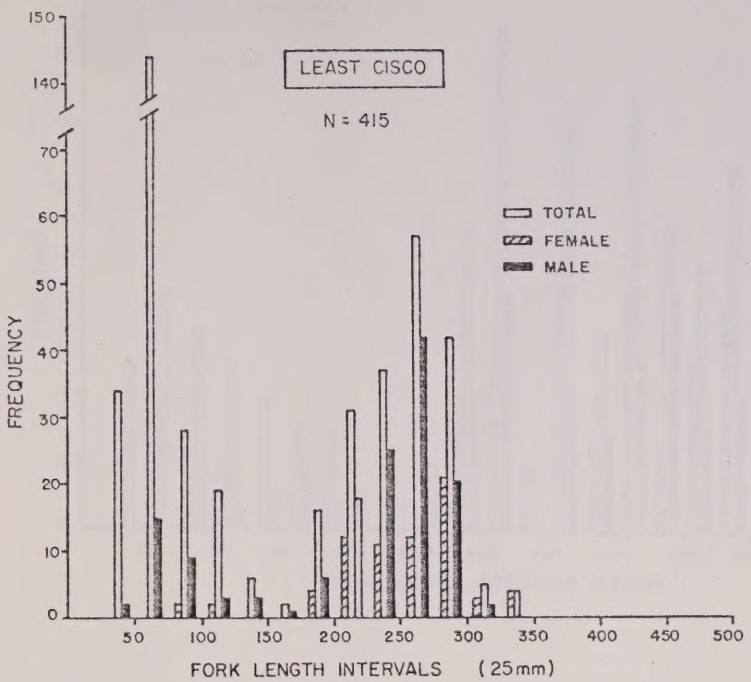
*Maturity not determined.

TABLE 9. Continued.

Fork Length (mm)	Northern Pike							
	Males			Females				
	N	%	% Mature	N	%	% Mature	Unsexed	Total
<50	0	-	-	0	-	-	21	21
50-74	0	-	-	0	-	-	8	8
75-99	1	50	0	1	50	0	10	12
100-124	0	-	-	0	-	-	8	8
125-149	1	50	0	1	50	0	1	3
150-174	0	-	-	0	-	-	1	1
175-199	0	-	-	0	-	-	0	0
200-224	1	100	0	0	-	-	0	1
225-249	0	-	-	0	-	-	0	0
250-274	0	-	-	0	-	-	2	2
275-299	2	67	0	1	33	0	0	3
300-324	2	100	0	0	-	-	0	2
325-349	0	-	-	0	-	-	0	0
350-374	8	67	38	4	33	0	2	14
375-399	6	86	67	1	14	0	1	8
400-424	1	50	0	1	50	0	1	3
425-449	6	86	50	1	14	100	3	10
450-474	12	80	92	3	20	67	1	16
475-499	3	30	100	7	70	71	0	10
500-524	6	60	100	4	40	75	7	17
525-549	2	22	100	7	78	83	5	14
550-574	7	70	100	3	30	100	5	15
574-599	3	33	100	6	67	67	2	11
600-624	3	43	100	4	57	100	4	11
625-649	0	-	-	3	100	100	4	7
650-674	4	80	100	1	20	100	3	8
675-699	1	50	*	1	50	100	1	3
700-724	1	25	100	3	75	67	0	4
725-749	0	-	-	1	100	100	3	4
750-774	1	100	100	0	-	-	1	2
775-799	0	-	-	1	100	100	0	1
800-824	0	-	-	0	-	-	2	2
825-849	0	-	-	0	-	-	1	1
850-874	0	-	-	1	100	100	0	1
875-899	0	-	-	0	-	-	0	0
900-924	0	-	-	0	-	-	0	0
925-949	0	-	-	1	100	100	0	1
950-974	0	-	-	0	-	-	2	2
975-999	0	-	-	0	-	-	2	2
>1000	2	67	100	1	33	100	0	3
TOTAL	73	56		57	44		101	231

* Maturity not determined

Figure 16. Length-frequency distributions for captured species from the Mackenzie Delta, 1975.


LEAST CISCO
N = 415
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (25mm)

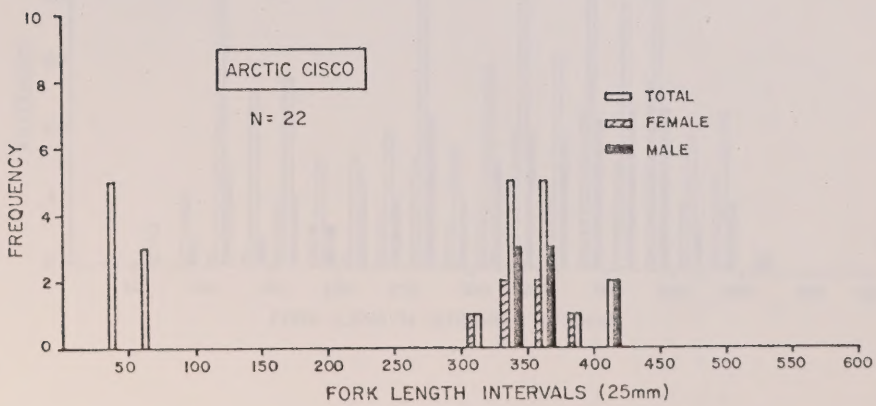
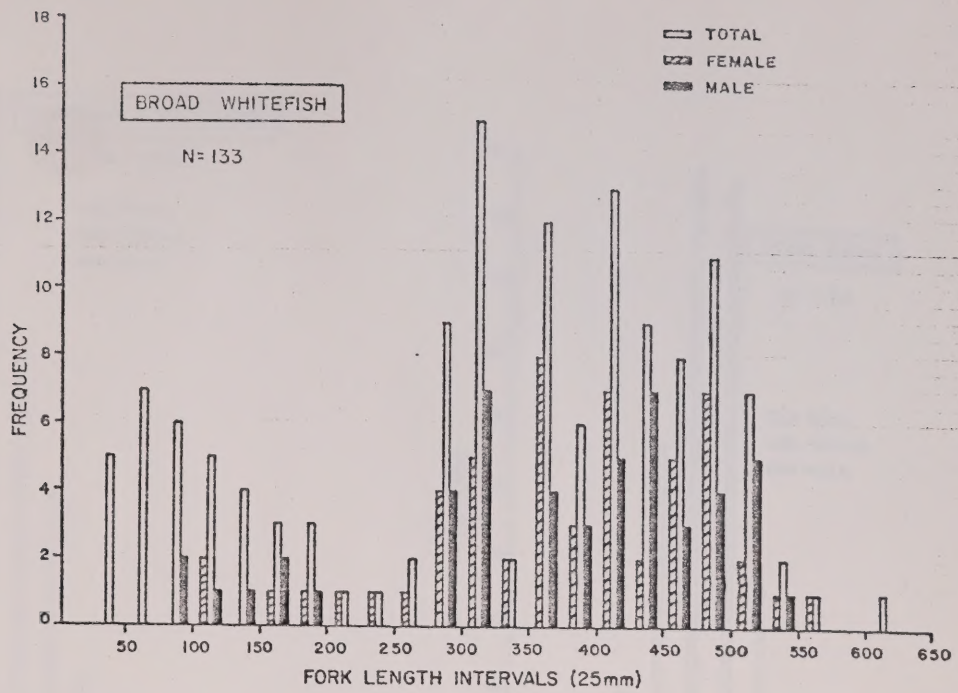

ARCTIC CISCO
N = 22
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (25mm)

FIGURE 16a


BROAD WHITEFISH
N= 133
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (25mm)

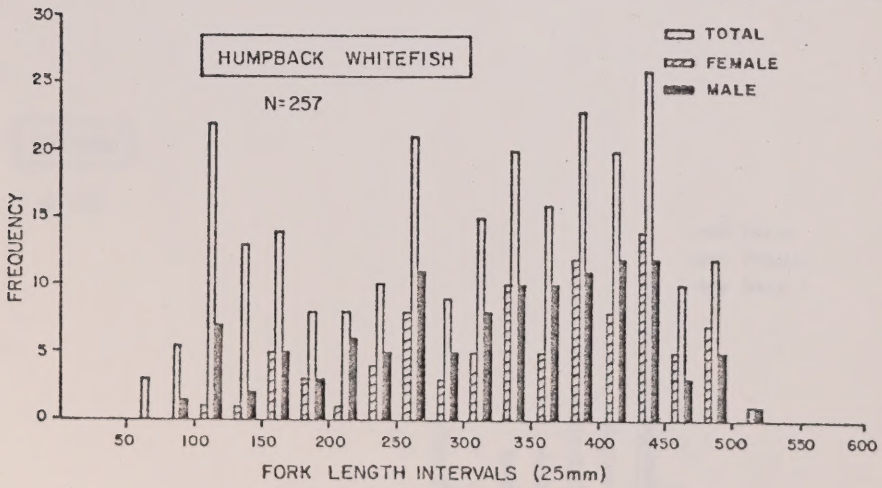
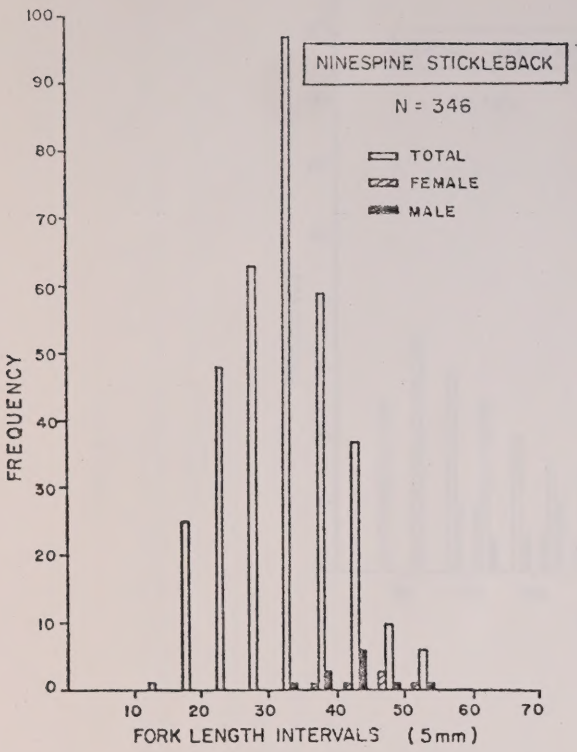
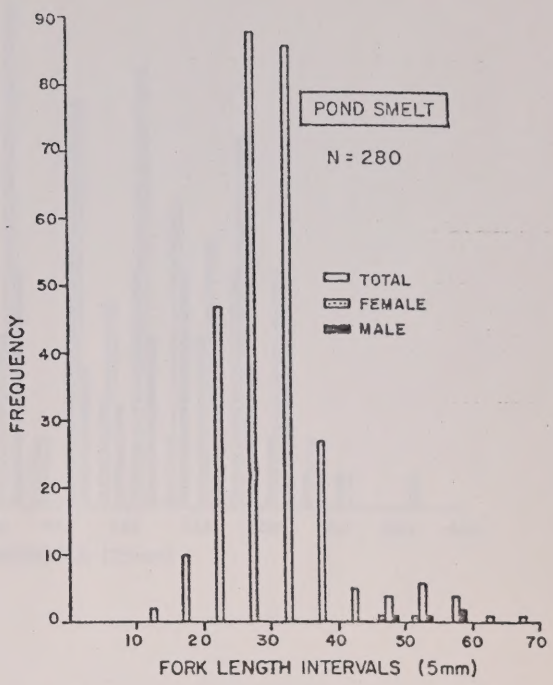

HUMPBACK WHITEFISH
N=257
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (25mm)

FIGURE 16b


NINESPINE STICKLEBACK
N = 346
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (5mm)


POND SMELT
N = 280
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (5mm)

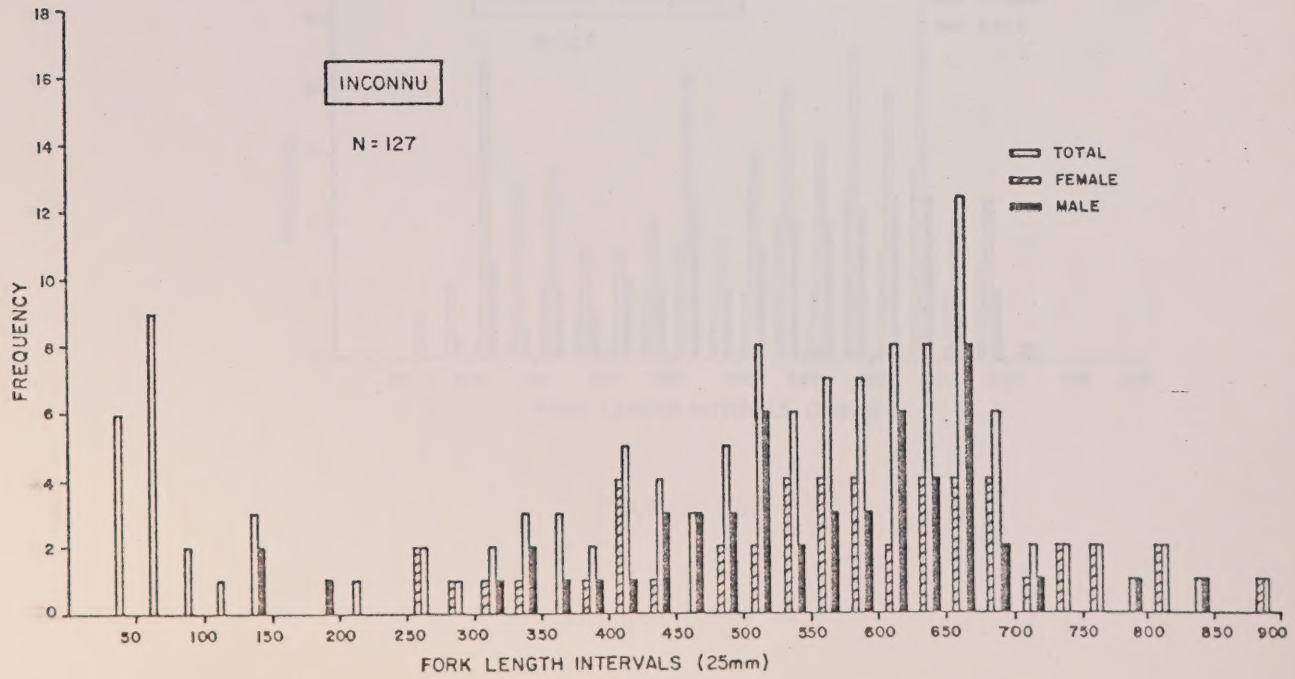
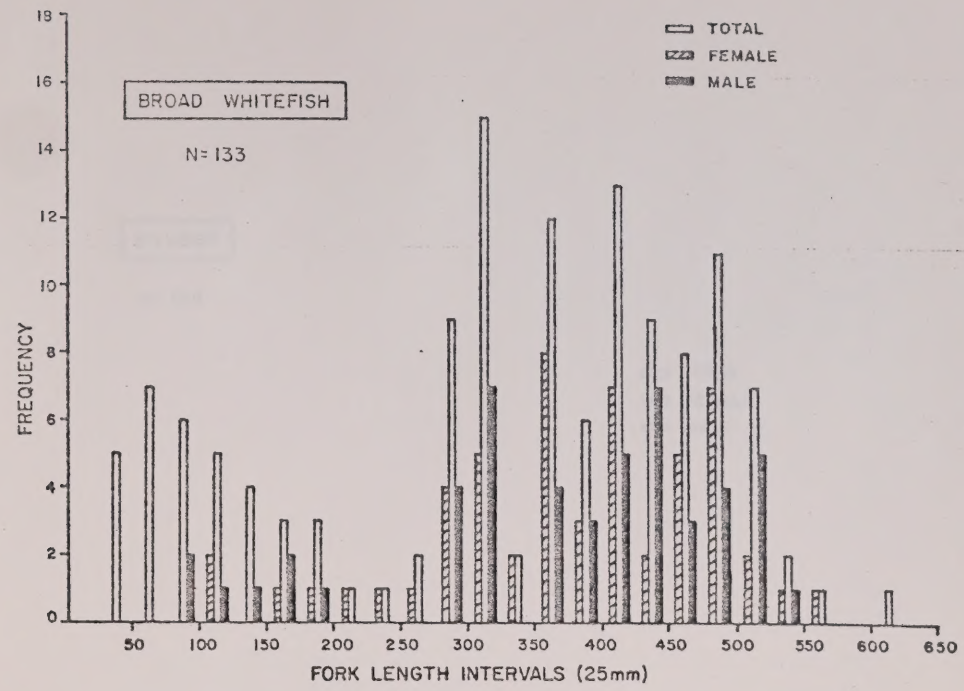

INCONNU
N = 127
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (25mm)

FIGURE 16c


TOTAL
FEMALE
MALE
BROAD WHITEFISH
N= 133
FREQUENCY
0
2
4
6
8
10
12
14
16
18
50
100
150
200
250
300
350
400
450
500
550
600
650
FORK LENGTH INTERVALS (25mm)

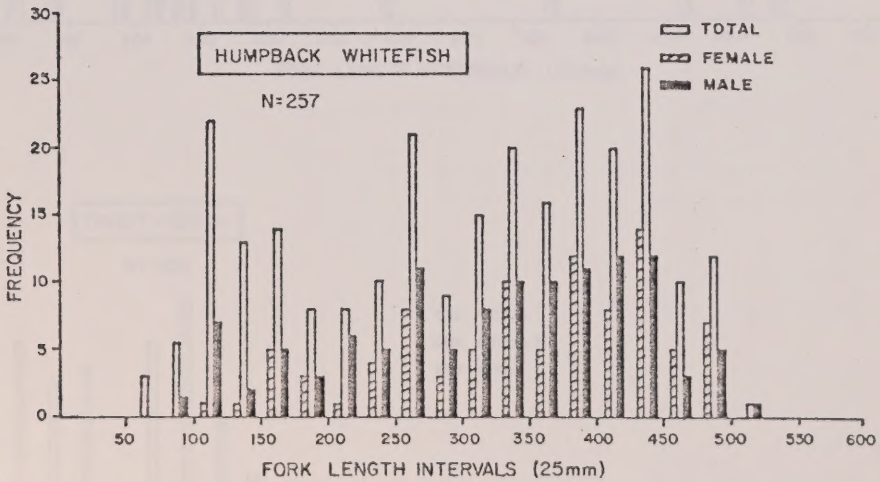
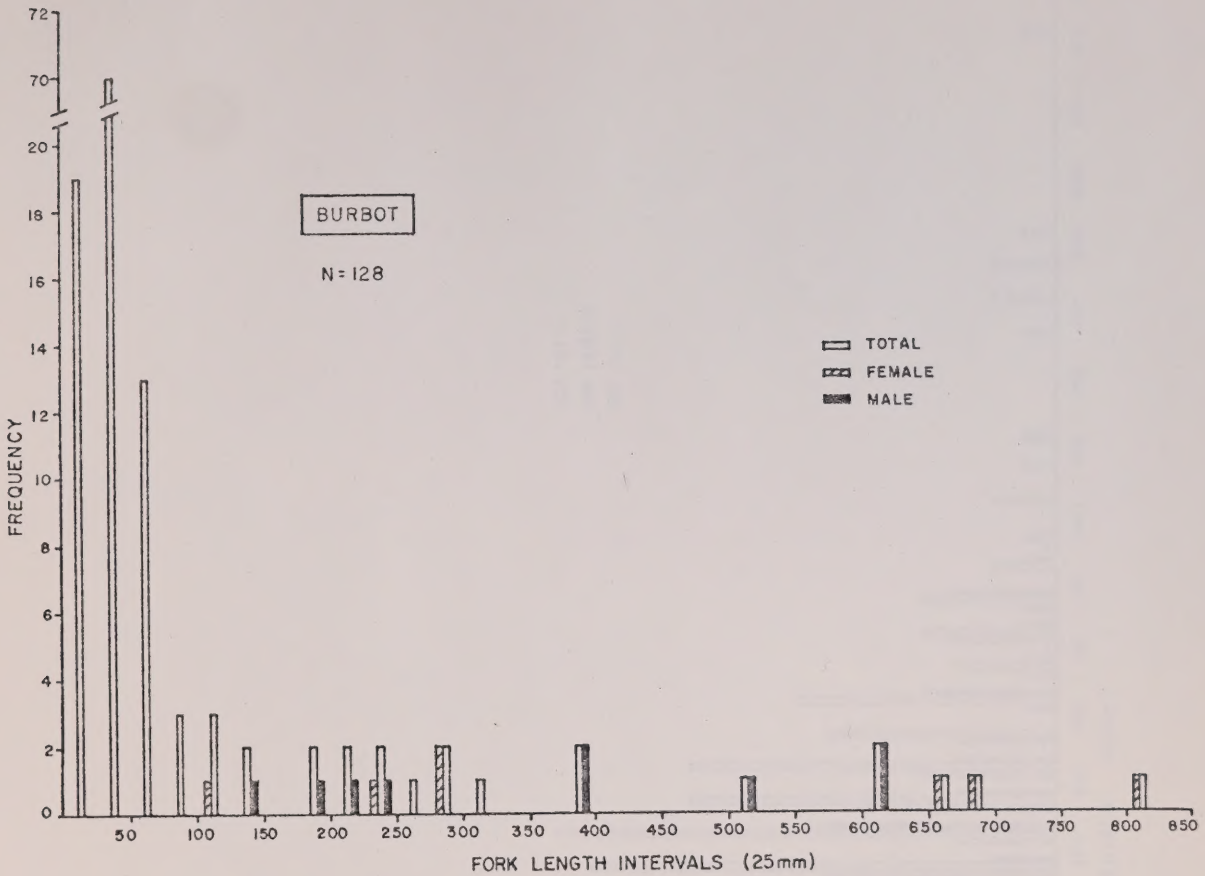

TOTAL
FEMALE
MALE
HUMPBACK WHITEFISH
N=257
FREQUENCY
0
5
10
15
20
25
30
50
100
150
200
250
300
350
400
450
500
550
600
FORK LENGTH INTERVALS (25mm)

FIGURE 16d


BURBOT
N= 128
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (25mm)

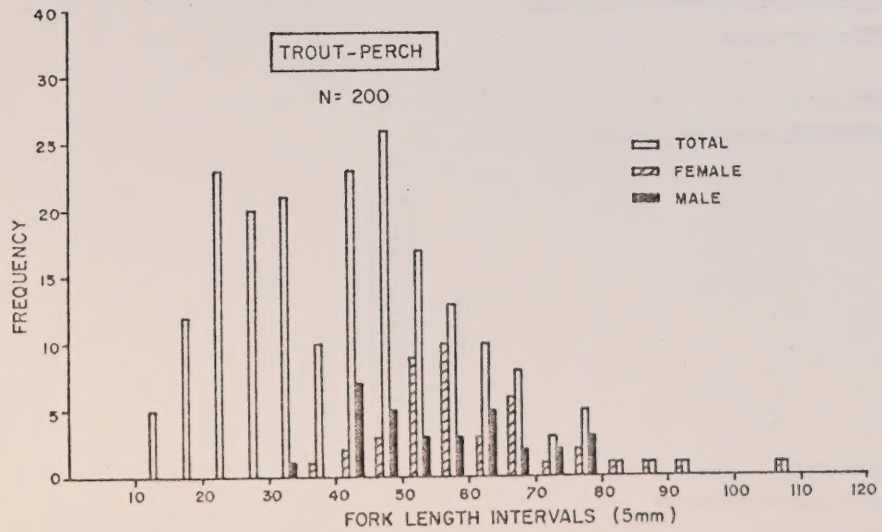

TROUT-PERCH
N= 200
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (5mm)

FIGURE 16e

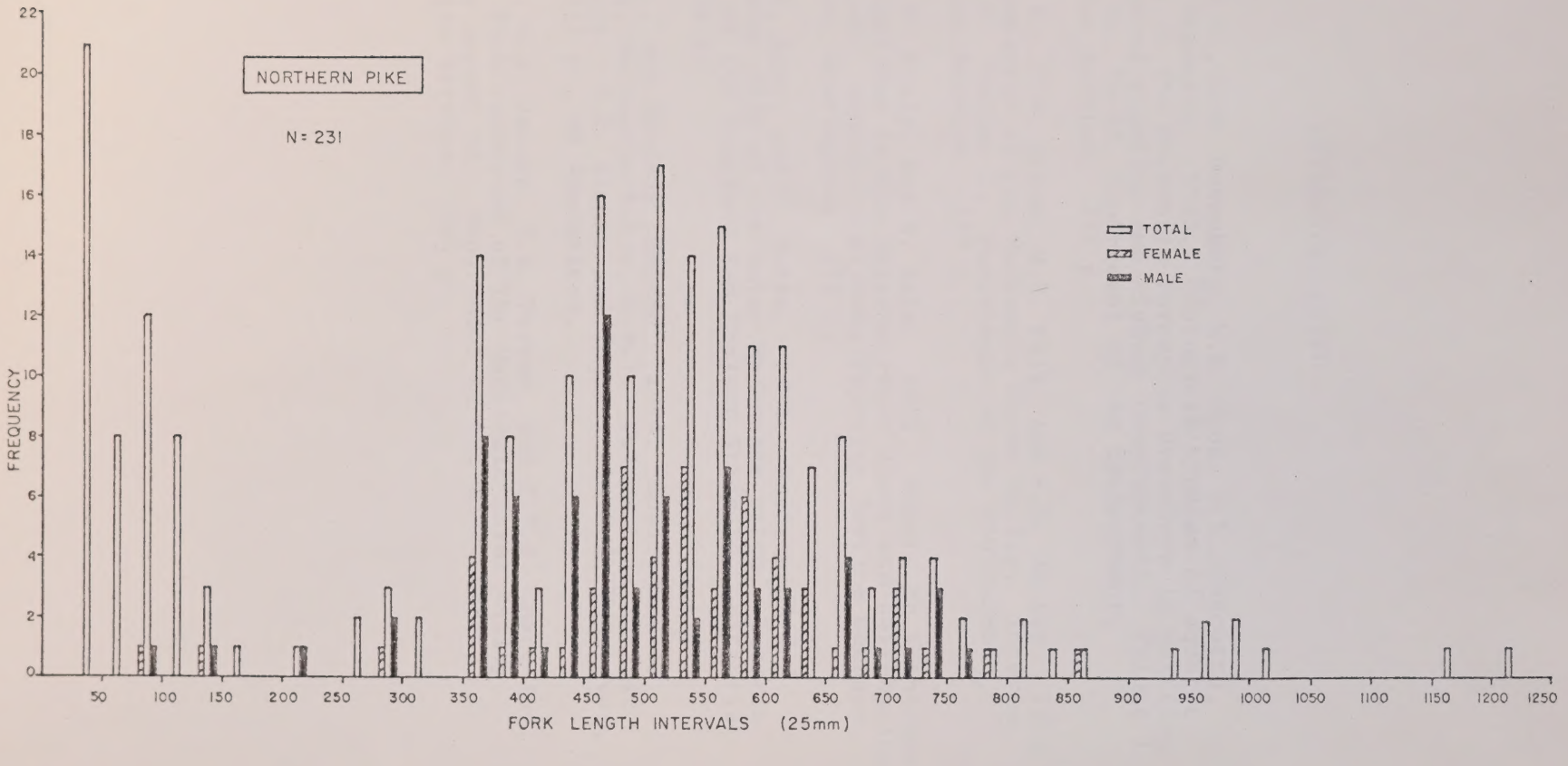

NORTHERN PIKE
N= 231
TOTAL
FEMALE
MALE
FREQUENCY
FORK LENGTH INTERVALS (25mm)

FIGURE 16f

LITERATURE CITED

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